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Trade Outlook.

Very cautious buying on the part of founders is a feature of the present iron market. The amount of metal being turned into castings shows no falling off, and the stock of iron in consumers' yards gives but little evidence of any material increase, in spite of exceptionally heavy production. With improvement in transportation facilities, the exasperating delays and inconveniences suffered by the foundryman have disappeared, and, as usual, the latter has forgotten the troubles he experienced a few months ago, and the advantages of carrying a reasonable supply of iron and coke will likely not occur to him until he is again caught short.

Labor complications in certain parts of the country have tended in an indirect way to reduce the demand for architectural castings, and perhaps other classes of foundry work as well, yet the general conditions prevailing in the trade are such that a falling off in one line is made up for by an increased demand in other directions. Although strifes in the labor field directly connected with the foundry are not supposed to amount to much, it is interesting to note that differences between foundries and their employes exist in no less than fifty localities at this time. Many of these are of a very trivial character, and none can be said to be really important.

While the merchant furnaces manufacturing foundry iron complain that the advances in labor, transportation charges, coke, ore, etc., will not permit them to operate at a profit, if the price of iron falls much lower, foundries seeking work in the general market express the belief that contracts for castings are being accepted at too low figures. Many of those shops who up to the present time have been receiving iron at relatively low figures on old-time contracts have been giving their customers the benefit of these prices and are now confronted with the fact that new contracts can only be placed at a material advance. Foundry coke is more plentiful and may be had at lower prices than have prevailed for a long time.

Projections of new plants show a decided falling off, although much work remains to be finished in the way of enlargements and improvements. Figures are not at hand, but it is well known that the foundry industry has expanded at a wonderful rate during the past two years, and the present capacity is undoubtedly able to take care of all the business that will be offered for some time to come.

The Small Converter Process for the Manufacture of Steel Castings.

BY ARTHUR SIMONSON.

In these days of high pressure and high speed, when machines and engines are called upon to bear heavier loads and stand greater strains than ever before, the use of steel castings in their construction is being more and more specified, and the need for a process of manufacture which will meet the requirements has become very great, especially for the smaller castings, say below one hundred pounds in weight. The open-hearth process

takes care of anything over this weight with ease and with greater economy probably than any other process, but buyers and users of steel castings find difficulty in getting their small work from the open-hearth people; in fact a gentleman connected with one of the principal shipyards in the United States recently told the writer that they had as yet been unable to obtain delivery of some small flanges that had been ordered two years.

The conditions to be met are as follows: The material must be genuine steel similar in composition and strength to the open-hearth, not semi-steel, or modified malleable iron of doubtful composition and properties; it must be very fluid in the ladle, in order to run the delicate and intricate patterns called for, and deliveries must be made as quickly as possible. Price is a secondary consideration, as buyers are willing to pay almost any price so long as they get the castings quickly and good. They must be free from blowholes, easily machined, and those which do not require to be machined must have a very fine skin, requiring very little chipping or filing.

The small converter process meets all these conditions with perfect satisfaction as has been proved by ten years of operation in Europe and three or four years in the United States. By its use castings from one ounce upwards can be made and in most cases they can be molded and cast one day, and cleaned and shipped the next, as they do not require annealing. This speed of delivery will be appreciated by any who have suffered the inconvenience of waiting many days or weeks for a steel casting to repair a breakdown, or get out a machine or engine on time.

The capacity of the converters is usually about two tons; they are acid lined and the daily output varies from two tons to as much as twenty tons. The patterns may be bedded in the floor or made in snap molds, which do not require to be dried; the metal is handled in ordinary hand or bull ladles, just the same as gray iron, in fact if a small converter is introduced into a gray iron foundry, the iron molders can make the molds and carry and pour the steel exactly as they have been accustomed to do iron. The only difference is that a different facing sand is used. In some cases, when small allowance is made for machining, or the shape of the pattern renders the mold particularly liable to cut in pouring, it may be skin dried, or coated with liquid mold wash and dried in the drying oven. Castings are being continually made up to as much as fifteen feet in length in molds skin-dried with a coal oil brazing torch. As these castings weigh less than one thousand pounds, it will be seen that their section is very light, and, as a matter of fact, it would be very difficult to make them in dry sand molds as the shrinkage in length of such a piece is over three inches and the casting would be pulled apart in a hard mold when contracting.

The steel making process consists in melting a carefully calculated mixture of pig iron and steel scrap in an ordinary cupola and transferring it to the converter, where it is blown by surface blast. The duration of the blow is about twenty minutes, at the end of which time there remains in the converter a bath of practically pure iron at a temperature of about 3300°. Recarburization is made in the converter if the entire heat is required of the same composition, or, in the individual ladles by means of carefully weighed packets of "physic," if it is required to make several different kinds of steel out of the same heat. The whole process is free from any complication, is under perfect control, and any intelligent man can learn how to run the blows in the converter in a short time.

There have been several small converter processes invented, but the only one that has given commercial satisfaction is the Tropenas process, such as is in operation at the plant of Wm. Wharton, Jr., & Co., Inc., Philadelphia, which was started two years ago by the writer and of which he is now in charge. A plant has also been recently put in operation by the United States government at the Washington Navy Yard. Since the plant was started by Messrs. Wm. Wharton, Jr., & Co. Inc., over seven hundred blows have been made without a single mishap. In any process of making steel in an acid lined furnace, the chemical action is the same, and consists in removing, by oxidation, the bulk of the carbon, silicon and manganese contained in a bath of crude metal introduced into the furnace. The action may be stopped when the desired amount of these elements has been eliminated, leaving the required percentages in the metal, or it may be continued till they are at the lowest limit, after which the exact amount of each is introduced by a weighed final addition. The latter is by far the safest and most accurate method.

Sulphur and phosphorus are not perceptibly

reduced by any of the acid lined furnaces, despite the claims of some inventors to the contrary, hence it is necessary that in purchasing melting stock these elements should be kept as low as possible. The phosphorus should not exceed .035 per cent nor the sulphur .030 per cent in the pig iron. The tendency is for the resulting percentages of sulphur and phosphorus to be slightly higher in the finished steel, on account of the shrinkage in bulk, due to the elimination of about two per cent of silicon, three quarters of one per cent of manganese, and three per cent of carbon, and the oxidation of a small amount of iron.

This renders these processes unsuitable for the manufacture of high grade tool steel, although, if the melting stock is low enough in sulphur and phosphorus, it can be made readily. Even under ordinary circumstances a fair grade of miner's drill steel and manganese steel can be satisfactorily made.

In the Tropenas converter, the loss in weight during the blowing process is about 10 per cent Small converter processes have been criticised adversely on account of this loss, but when it is considered that almost six per cent of this loss is composed of tne carbon silicon and manganese, which have taken the place of fuel and by their combustion raised the temperature of the bath, it cannot be considered as waste, though lost.

The Tropenas process and plant consists of a converter lined with silica brick and having two rows of tuyeres placed horizontally through the side of the vessel and extending round a portion only of the circumference. Before commencing the blow, sufficient iron is tapped into a ladle from the cupola and poured into the converter, to bring the level just up to the bottom edge of the lower tuyeres, when the converter is inclined at a small angle to the vertical, making the tuyeres slope down slightly towards the surface of the bath. Blast at a pressure of about three pounds is turned on from a positive pressure blower through the lower tuyeres only, the upper ones remaining closed at this stage. The oxidation then commences, and the silicon is eliminated during the first period of the blow, at the same time the carbon being changed from the graphitic to the combined state. When, by the combustion of the silicon, the temperature has been raised to a certain point, the carbon and manganese commence to burn, and it should be so arranged that the initial silicon is not too high, for above a certain temperature the oxygen will combine with the carbon rather than the silicon, and the resulting silicon in the steel will be too high.

At the point where the carbon-manganese flame makes its appearance, the upper tuyeres are opened at the discretion of the operator to a greater or less degree and, by this means, the carbon which is partially consumed by the action of the lower tuyeres, is supplied with supplementary oxygen and completely burned to CO_2, generating more heat, which is absorbed by the steel. This is one of the important features of the Tropenas process and contributes largely to its success, as it makes the steel very hot and fluid. In the second period of the blow, clearly indicated by the flame coming out of the mouth of the converter, the manganese is being rapidly eliminated, in fact, sometimes the gas is generated so rapidly as to cause the bath to appear to boil and projections of small amounts of slag take place at the mouth of the vessel, these being caused by the explosion of the bubbles of gas passing through the slag. By watching the indications at the mouth of the converter, the operator has a very good physical check on the chemical analysis of his cupola mixture; if the carbon flame is too long in making its appearance, the silicon is too high. This time should be only four or five minutes. If the flame comes too soon, the silicon is low, and the blow will probably be less hot than usual. If, in the second period, the blow is dirty, that is, throws out a great many projections, he should look to the manganese for an explanation. During the last period, the carbon is gradually burned out, the flame finally dies down and the blow is finished. To keep the blast on after the flame drops, would be to burn the iron and ruin the lining of the converter, but the indications are much too clear to allow of such a mistake being easily made. When the flame falls, the converter is turned down to bring the metal clear away from the tuyeres, the blast is shut off, and the final addition of ferro-manganese, spiegel and so forth is made, either cold or melted, as the case may be. A skimming device is fixed in the mouth of the converter, and it is then used as a reservoir from which the bull ladles are filled as rapidly as they can be carried away and poured, the converter being fitted with an electric motor and controller for tilting purposes.

The appended table shows the action of the

air on the bath during the progress of the blow. It indicates clearly the chemical changes taking place, and their sequence, the "silicon," "manganese," and "carbon" periods, and also the inertia of sulphur and phosphorus.

TABLE SHOWING CHEMICAL ACTION IN THE CONVERTER.

METAL SAMPLES.

	Metal direct from Cupola before Blowing	After five minutes Blowing	After twelve minutes Blowing	After fourteen minutes Blowing	After eighteen minutes Blowing	End of Blow	After final Addition
Graphitic Carbon ...	3.18	2.92	.....	.....	.....	.....	.....
Combined Carbon ...	0.35	0.34	2.90	2.30	0.86	0.10	0.24
Silicon	2.31	1.62	0.466	0.382	0.084	0.074	0.326
Sulphur	0.037	0.037	0.035	0.036	0.038	0.038	0.037
Phosphorus	0.054	0.053	0.054	0.054	0.051	0.050	0.058
Manganese..	0.61	0.60	0.101	0.040	0.040	0.042	1.08

SLAGS.

Si. O_2..	49.55	36.75	42.50	50.90	51.00	This sample was not reliable, being contaminated with a portion of the lining of the Converter.	61.30
$Fe._2 O_3$	3.27	3.28	4.05	5.85	6.85		7.90
Fe. O	5.52	45.90	39.85	29.00	28.40		16.31
$Al._2 O_3$.....	8.90	2.80	2.10	2.05	2.01		2.35
Ca. O..	24.50	1.80	1.70	1.55	1.55		1.75
Mg. O.	0.54	0.360	0.234	0.234	0.290		0.396
$P_2 O_5$.....	Trace	Trace	Trace	Trace	Trace		Trace
S.	0.076	Trace	Trace	Trace	Trace		Trace
Mn. O.	8.37	9.87	9.12	9.90	10.04		10.416

To show the ease with which the process is handled and the complete control over it the following is a description of an ordinary day's work in a Tropenas foundry. The forenoon is devoted to making the green sand molds and fitting up any that have been dried in the oven over night. At the same time the cupola is daubed up and got ready for lighting, and a coke fire is started in the converter. When the wind goes on the cupola, a gentle blast is also turned on the converter, and, by the time the iron is melted in the cupola the lining of the converter is white hot. The coke is dumped out and the iron put in, when the blowing proper immediately commences. Twenty-five minutes later the molders are pouring steel and it takes them about twenty minutes to pour off the heat. By that time the next charge of iron is ready for the converter, and from then on a heat is ready to be poured every forty-five or fifty minutes. If the first heat is commenced at 2 o'clock, by 6 o'clock ten tons of steel can be poured, which means a great many very small castings. When the pouring is all done, the bottom is dropped and the plant shut down till next day. This is repeated every day, from Monday to Friday, and the necessary repairs to converter and cupola linings are made on Saturday.

At the plant mentioned above, three principal grades of steel are made, although any specifications can be met, either as to analysis or physical properties.

No. 1.	For electrical purposes:— Cd. C. 0.10. Si. 0.070. Mn. 0.05	S. 0.04 P. 0.05
No. 2.	For general machinery:— Cd. C. 0.30. Si. 0.25. Mn. 0.75	
No. 3.	For gears, hydraulic & R. R. work:— Cd. C. 0.42. Si. 0.30. Mn. 0.90	

The first has a tensile strength of about 50,000 pounds; the second, 65/75,000 pounds, and the third, 75/85,000 pounds.

As to the cost, the steel in the ladle, ready to pour, costs to-day about two cents per pound. The cost of finished castings is in proportion to the skill of the molders, and the equipment and management of the foundry.

In conclusion, it may be stated as the writer's opinion, that the ideal situation for a small converter plant is as a side line to an open-hearth plant, where it can select the castings best suited to its capacity and make all the other castings that cannot possibly, or at least economically, be made by the open-hearth. Under these conditions the fixed charges and cost of operating would be reduced to the minimum.

Making Their Own Iron.

Some interesting experiments have recently been made at the foundry of the Utica Heater Co., Utica, N. Y., in using a certain percentage of magnetic iron ore from the mines of the Salisbury Steel & Iron Co. in the regular cupola charges. It is stated that the ore reduces satisfactorily and gives a mixture which meets all requirements for machinery castings, being strong and yet of a soft character. The process has been patented by Marcus Ruthenburg, of Philadelphia.

The Cherrytree Iron Works, of Grant, Pa., have erected a foundry 36x70 feet and a machine shop 36x80 feet. Other extensions will be made as the business demands. A specialty will be made of the manufacture of mining cars and general repair work. R. D. Tonkin is manager of the new concern.

The Milwaukee Convention of the American Foundrymen's Association.

The eighth annual convention of the American Foundrymen's Association was called to order June 9th in the club room of the Hotel Pfister, Milwaukee, by President Arthur W. Walker, who introduced W. J. Turner, of the Western Malleable & Gray Iron Mfg. Co., the latter extending a hearty welcome to the visitors on behalf of the foundrymen of the Cream City. At the conclusion of his remarks Mr. Turner presented Mayor David S. Rose, who delivered one of the most eloquent addresses ever made before a gathering of foundrymen, confining his remarks mostly to Milwaukee's advantages as a manufacturing center and the high character of its inhabitants, which guaranteed law and order. He said in part:

"We have received great public recognition and reputation upon one particular product, that of beer, but as to this being our greatest, we desire to disabuse all intelligent minds. While we are in no way ashamed of our brewing industries, which are the greatest in the world, that product sinks into almost insignificance as compared to our great iron industries, our great machinery building concerns, our forty foundries and iron works; our greatest tanneries in the county; our largest trunk manufacturing plants, and other things in which we are also justly proud, and of the aggregate manufactured products of Milwaukee, beer last year only represented about $20,000,000. This as against $80,000,000 of iron products turned out in the same period.

"Milwaukee is a city in which the laboring people to a very large extent own their homes, and these artisans are therefore of the most conservative. We have had strikes here, as all large manufacturing centers have had;

IRVING H. REYNOLDS.

CHAS. E. SAMMOND.

E. N. DICKSON.

T. W. SHERIFFS.

A. W. BAIR.

A. F. A. Entertainers at Milwaukee. Executive Committee of Local Foundrymen.

but I can say advisedly that during the past five years these have been without unusual disturbances. Our labor is of the best, and harmony, as a rule, reigns here. We have no tenement districts in Milwaukee. We believe in the good old doctrine that the least governed city is the best governed, and while we have some 1,750 saloons that are not required to close their doors from the beginning to the end of the year, we have less drunkenness in Milwaukee and less crime than any city of its class upon the face of this earth. We have forty miles of dockage, and room for more industries. Here the investor finds better opportunities than in almost any other city."

Willis Brown, of the Walker Foundry Co., Erie, Pa., responded on behalf of the association in a humorous speech that brought about much merriment. At its conclusion the convention settled down to business, beginning with the

Address of the President

which follows:

The close of another year brings us again to a statement of the conditions and affairs of our association, and the general conditions and outlook of the trade. The most important change within the association during the year is the establishment of a section for foundry foremen, and also a section for foundry metallurgists. The former was created in response to a request from the association of foundry foremen now existing, who desired to affiliate with us, from an educational standpoint, which is theirs also. The negotiations which were authorized at the convention in Boston, were afterwards concluded, and were quite simple in character. It was shown by the constitution of the foundry foremen's association that their object was purely one of mutual benefit through educational methods. Your executive board therefore placed them upon the same basis as the local foundrymen's associations now affiliated with us, as to annual dues. It was further agreed that inasmuch as the volume of the convention business warranted its subdivision into sections, that questions and papers relating to the practical operation of the foundry be delegated to the foremen's section, they having charge of one session of the convention, for this purpose. A chairman and secretary were appointed to carry this out efficiently. Similar action was taken with respect to the metallurgical questions now so frequently arising. A section for foundry metallurgists, authorized by the association at its last convention, has been duly established, and a chairman and secretary appointed.

By subdivision of the work in this manner, and the appointment of officers for the sections, it is intended to enlarge the usefulness of the association, as well as give members attending the convention an opportunity to select those subjects most interesting to them.

It was agreed that all matters coming up at the sections, as well as in the associations affiliated with us, would be published in our journal, if of interest to the association at large.

It is further agreed, in view of the demand generally expressed, that steps be taken to organize sections for pattern foremen, and for foundry accountants, both of these branches of office and work management offering lines of standardization which would be of marked value to the industry in effecting economies.

Something might be done for our apprentices in the way of education in their trade, when they cannot avail themselves of schools or correspondence schools. If it were possible for foundrymen to obtain short instruction papers from our association on subjects related to their work, for distribution among apprentices and men, it is probable that interest would be created; and many of the younger men could enter the present correspondence schools, or the hoped-for trade school for molders. The members of the association might receive great benefit from such a course.

Regarding the condition of the trade from a business point of view, we have passed through a year of extremely high values. No one can be sure whether this period will long continue. Prices for coke appear to have receded permanently, and values of pig iron are somewhat lower, with a tendency slightly downward.

We have passed through the difficulties of a rapidly rising market. I hope we shall not experience the trials of a rapidly falling market, which is, in my belief, even more difficult for the manufacturer. It requires high ability to manage a business with satisfactory profit while prices are falling. I suppose we would all prefer that, a high level as to costs having been reached, present conditions might continue indefinitely. Let us then hope that such may be the case, but it does not seem possible that such hopes will be realized. Perhaps the best we can expect is that the

fall in values may be uniformly distributed over a long period.

I believe it appropriate also to refer to our relations to those employed by us, commonly known as the "labor problem." This subject is prominent in many foundries, and will require our best thought and judgment for some time to come. I will speak briefly of the lines which have been thus far followed in its development.

Since the close of the civil war, the wonderful growth of manufacturing industries has brought into prominence the various labor unions. They have been the natural result of existing conditions. Inexperienced and crude in organization and method, the unions at first made demands which could not be granted without a struggle. Strikes were therefore frequent, some of them serious, many of them unjustifiable, and for a number of them the blame might be placed upon the employers.

From these earlier methods of dealing with labor, we have developed the condition of the present, which may be described as one of better organization on both sides. Some of the unions have become national in extent. Many employers are also affiliated, in associations for united action and defense. Each side has a large fund to give support to any course it may determine upon. Such reserve power tends to make both sides reasonable. We have gained in experience, and better understand the fair and equitable settlement of business problems by the application of common sense. In our industry this is the state of things today. Many prominent employers believe we have attained the ideal relation between capital and labor. We have certainly improved upon earlier conditions and yet from a certain point of view these present methods are but a step forward, and do not reach the final ideal. We may therefore expect to modify or abandon them later.

The present situation in our trade—a powerful labor organization on one side, and no less powerful associations for defense on the other—is similar to that of the nations of the world, with respect to their naval armament. As strong navies are a guarantee of continued peace, so large and constantly increasing funds available for instant use by these strong organizations may insure industrial quiet. But great military and naval strength, while doubtless the most practicable peacemaker now, will in some period be obsolete for that purpose. As the increasing effectiveness of modern weapons makes war absurd, unreasonable, and finally impossible, so large reserve funds may in time cease to be the chief reliance in dealing with labor.

If then, our present ways of dealing with this subject seem to fall short of the ideal, what methods will in time replace them? We cannot expect past or present notions to suit the new and everbroadening future, in this or in any other department of our business.

I do not assume to have the gift of prophecy, nor to be more enlightened than other men, but I beg to offer a few suggestions which may indicate the probable future trend of thought and action in dealing with the labor problem.

In the first place, then, we must have the same common sense and progressive spirit in handling labor as in the development of new processes. We cannot expect present methods of manufacture to long continue, neither can we hope that the present manner of dealing with labor will remain satisfactory during the next ten or twenty years.

Neither can we expect in this country to permanently withhold from our workmen a fair proportion of income from manufacturing enterprises. Nor can we hope to crush labor unions, or by large defense funds to settle finally the economic questions involved. The manufacturer who is wisely building for the future will study to work with his employes rather than against them, to please them; to unite his managing ability with their muscle and skill. If new methods of dealing with labor problems are to be in this direction, it may require a change of heart on the part of many.

The health and comfort of workmen in the shop is a matter so old it is hardly necessary to refer to it. We cannot expect a workman who is uncomfortable, and trying to perform a difficult operation without sufficient light, or air, or adequate appliances, to be in a frame of mind suitable for working wholly in his employer's interest. For some, therefore, a first step in the establishment of cordial relations between employer and workmen may be to study the comfort and convenience of employes. This is, however, only the first step; others will be clear to any employer who approaches the subject with an honest desire to do what he can.

We shall come to understand in the future

that a manufacturer should be willing to pay the highest wages that the state of his industry will permit; his workmen are his partners; why should their welfare not concern him even more than that of his customers?

It may be well to inform employes relative to the business details of any enterprise. When a factory is busy, they suspect enormous profits. They do not understand, nor consider the relation of cost to selling prices. They cannot know whether orders are filled at a loss, were various expenses considered. If such information could be given it would make men more reasonable in their requests. An easily-raised objection is the tendency of such a course to advance wages in prosperous times; but the liberal minded manufacturer will not object to this. When dull times return, the men must expect the inevitable reduction of wages; if they are entirely satisfied that they are based upon the true state of the business, they will accept such reductions with content. The manufacturer must be honest with his men, and his men will be honest and fair with him. The American mechanic wants to be treated squarely. If he is sure of this, he is willing to share with his employer the burden of dull times.

I am not saying that the earnings of the men should be in direct proportion to the profits of the employer; but earnings do and should bear some relation to profits. Many contests have arisen over this matter, some due to insufficient information, or an unreasonable concealment of real conditions by the employer.

I believe in the good sense and fair intent of any body of American mechanics when they are squarely met in an honest straight-forward and business-like manner on any question with which they can be made familiar, and questions of market conditions, costs, selling expenses and profit are not complicated, although they may be made to appear so. They can be stripped of all complications, and any employer who is fit to continue in business can present them to his workmen in a form easily understood. If we would give as much time and thought to informing and educating our employes as we now spend in trying to please our customers, the effect would, I think, be helpful.

Sometimes an employer may go so far in prosperous times as to distribute a portion of his profits among his men. But it is not entirely a question of money with the American mechanic. The rapid development of business has separated him from his former contact with his employer; his imperfect notion of profits and similar matters has made him discontented.

The professional labor agitator is a logical product of the time; employers should make him unnecessary, and we shall hear no more of him. There is a reasonable and proper place for the real labor leader; one who by nature and education is fitted to counsel, advise and conciliate; who is honest, sincere and always fair; who understands business and the position of business men. This ideal labor leader, as I have described him, is a more highly idealized product of civilization than the average employer of the present time. It is expecting too much that he should materialize at once; but in time he should appear, and I believe will do so. Employers should first themselves show him the pattern in the conduct of their own business. Neither the laboring man nor his representative can be expected to advance in these matters until employers have advanced first.

I believe that there are manufacturers who are studying closely this way of dealing with labor, and are making progress along these general lines. They are not saying very much about it, and are not quite sure whether they can make a success of it. Some of them will doubtless fail to reach their ideal, and all of them will be disappointed at times; but in this, as in other matters, no honest and earnest effort entirely fails. All of us who deal with employes must expect frequently to be misunderstood and possibly abused for trying to get into closer relations with them. It must also be admitted that some of our theories and attempts in this direction have been mistakes.

It seems to me almost, if not quite true, that the manufacturers who will achieve the highest development and success during the next ten or twenty years will be those who recognize the present conditions as temporary, and put themselves in line for permanent harmonious and cordial relations with the men who are doing for them in factory or foundry the work which they themselves would do if the size of their enterprise would permit.

With a face turned toward the bright future, and a heart full of hope, I look for that new and enlightened relationship upon which we may soon enter; a better feeling between em-

Photo by Klein & Guttenstein, Milwaukee

A PART OF THE VISITORS AT THE WEST ALLIS FOUNDRY OF THE ALLIS-CHALMERS CO.

ployer and employe, a relationship most cordial, a spirit of mutual helpfulness; the prevalence of common sense and mutual forbearance. The manufacturer with a hundred or a thousand men associated with him in the production of any kind of goods, all working harmoniously together, with intelligent united effort, and with a sincere desire of all—the owner, the lowest workman, and all the men between,—to bear a full share of responsibility, and put forth the greatest effort for the common good, is an industrial combination which will stand against the world.

After finishing the reading of his address Mr. Walker called attention to the difference in iron prices existing during the first months of the current year and those prevailing a year ago, and the consequent uncertainty as to the cost of manufacture in the immediate future. Mr. Moldenke followed with the

Report of the Secretary.

It will be generally conceded that the supreme rush in our business is now over. The

high point has been passed, but we have yet before us a period of steady production at fair prices. It is but natural that the coming few years will bring forth many changes in methods of running our foundries, and this feeling has been very freely reflected from the general correspondence of this office. A marked interest is taken in "continuous running" of foundries, information has been called for, advice wanted, the pros and cons argued out, all of which shows that the running of foundries night and day, and pouring continuously, may not be so far off as is sometimes imagined. It is realized that while our foundries are now able to handle the work offered them, and that for some time to come they will probably be run below their full capacity, yet that when the next great wave of prosperity arrives, the question will rather be one of utilizing the plant capacity to the utmost, than making enlargements. It will therefore be well to ventilate this question of continuous running very thoroughly, and thus in a way provide our membership with the necessary information in good time.

It is further generally conceded that only in educating our present and coming laborers will we overcome the evils that are steadily growing and hampering the fullest development of the industry. We need better apprentices and more of them; better informed molders, and more of them; better machine-hands, better pattern-makers, better core-makers, better foremen, in fact we want highly paid and valuable specialists, so to speak, in every corner of the foundry. In this way we will increase the net gain for the yearly turnover, and not only produce better work, but make life more worth living.

To do this we must begin at the bottom. We must furnish the apprentice the means to acquire the information that is to be the foundation of his life work. The correspondence schools are doing excellent work in this direction, but not every boy can avail himself of this opportunity. How many of our boys in the foundry and girls in the core room must help to support the family, and cannot therefore acquire an education, even if they desired it. Then again, it is far better that the foreman, who must be a natural teacher to be of full value to his employers, gives the apprentice his first rudiments of the molding art. After this, and when the boy may be earning better wages, the correspondence schools will be valuable adjuncts in his career.

I would therefore recommend that short and elementary instruction papers be prepared under the direction of a special committee, and issued by this association to our foundrymen at cost, for distribution among the employes in the foundry. The information thus disseminated would prove valuable in time. I saw an instance of this nature this winter, which demonstrated the good that can come from such a labor of love. Apprentices, molders, and even clerks from the office eagerly absorbed the information thus given by the foreman of a large foundry in the East. Not a Sunday, on which important repairs were made, passed without finding the students all engaged in noting cupola and other repairs, and lending a hand just for the experience it taught them, not to speak of the alertness of everyone to note mistakes that might be made by the men in the ordinary shop routine. Here was an ideal situation. A corps of men that could be drawn upon, and depended upon, in emergencies, and all willing to assist the company as part of their system of education. I may add that every one of these students is striving to become at least a foreman. Were every foundry thus constituted, we would not hear of strikes, and ordinary business capacity on the part of the management would not find it difficult to keep the shop full at all times, even at the expense of the rest of the world.

The third point I desire to bring up is the recommendation of our fellow-member, Stanley G. Flagg, Jr., who urges the association to do something in the way of original investigation for the purpose of overcoming difficulties in foundry practice. If this be not possible, then to encourage others in doing so, by advice and financial aid. The recent endowments by Mr. Carnegie along just these lines, though more naturally for the wider field of steel, may serve as an example. We might therefore get in touch with the universities where young men are preparing themselves for a life career, and would be only too glad to work on problems which have substantial after-results in a commercial way. The materials necessary would have to be furnished, and constant advice and conference with a special committee of our association would constitute our end of it. It would therefore be well to go into this question also, and see if something cannot be done of permanent value to the foundry industry.

An unusual amount of interest has been directed to the study of cast iron during the year, the direct consequence of which was the appointment of a representative committee of producers and users of cast iron. The purpose of this committee is to draw up standard specications for testing cast iron and finished castings. This committee of 68 members, appointed jointly by the International, and the American Societies for Testing Materials, finds our association well represented. Work is being pushed along rapidly and the results of our own investigations will be freely drawn upon. The full significance of this departure cannot yet be fairly gauged, but it really means that cast iron has been advanced into that class of our industries which may be termed the more exact. The hap-hazard methods of the past are being relegated to the rear, and science and practice are combined to hold the field for much of our work formerly in great danger of drifting into the malleable and steel casting plants.

Turning now to our own affairs, we can chronicle a most active and successful year. Thanks to the generosity of the New England Foundrymen's Association, who donated $425 to our treasury, to the proceeds of the Standardizing Bureau which gave us a profit of over $350, and finally to the Philadelphia Foundrymen's Association, who voted $100 to us to cover subscriptions to the *Journal* for its members, we can report an unusually large amount of literature distributed, all bills paid, and a balance of $58.05 in the treasury. The income for the year was $3,175.52, and the expenses $3,117.47.

Our members and subscribers now numbers 317, and the indications point to a more rapid growth, due to the recent establishments of two special sections within the association, to facilitate the transaction of special lines of work. Much is expected from the new sections for foundry foremen and for the metallurgists. In the case of the latter, there has now been created a common ground for furnace and foundry. This has been quickly recognized, and we already count in our membership many furnace managers, and members of their official families. The work of these sections will best speak for itself.

Treasurer's Report.

The statement of the association's financial affairs has previously been quoted in the report of the secretary. Treasurer Willis Brown showed that all bills had been paid leaving a small balance on hand.

Reports of Committees.

Thomas D. West, chairman of the association's standardizing bureau, showed in his report that standard drillings continue to grow in favor, their value being recognized abroad as well as at home.

The committee having in charge the standardizing of methods relating to determining the constituents of cast iron announced that all the methods sent in by the many chemists interested were duly turned over to the new metallurgical section created within the association. Its secretary, H. E. Field, has carefully worked out a very systematic résumé of the almost endless modifications of well-known methods, and in this way presented a clear and comprehensive grouping of data upon which to work. It will now become a study of how far the reasons for elaborating the details of otherwise simple processes are founded on fact, and this will naturally take time and the practical interest of the best men in the profession.

When, therefore, the metallurgical section has been fully organized, work will commence along these lines, and it is to be hoped, something tangible will result. From the universal interest aroused by this undertaking here and abroad, it may be readily seen that a vast amount of good is expected, and we hope that the next report on this subject may at least show the standardization of methods for determining one or two of the elements we deal with so much in our purchases and daily work.

The committee appointed to determine standard methods of sampling pig iron reported that the specifications for sampling pig iron submitted at the last convention for discussion, have been widely distributed, and so far have met with but one objection. This related to the use of the magnet in cleaning the sample. It seems that the even distribution of the graphite is liable to be disturbed by the too free use of the magnet, and that therefore this procedure is objected to by some chemists. In view of the formation of an international committee on the testing of cast iron and finished castings, which embraces not only our interests as foundrymen, or buyers of pig iron, but also those of the furnaces themselves, it has been deemed best to turn over

our results to the sub-committee on pig iron, of that body, so that the final methods adopted may be accepted by all parties interested, the personnel of the committee assuring this assumption.

We therefore beg that this matter of standard methods of sampling pig iron be left for a final report after the deliberations of the International committee have resulted in arranging for standards, at least so far as the American practice is concerned. We can then endorse these methods if they fit our requirements, and know that they also meet with the approval of the other interests.

The subject of the proper valuation of foundry pig iron, which was referred to a committee at the Boston convention, was touched upon by the latter who said that it is a very generally accepted proposition among foundrymen that the most reliable way to test pig iron is to remelt it in the cupola and pour into regular castings. In this way any possible accidents of fracture appearance in the pig iron tried, whether they are the result of furnace troubles or the deliberate desire to make a forge iron look like a No. 1 X, are eliminated, and the founder knows just what he is getting. On the other hand, it is also realized that unless proper methods are followed, only the best of coke is used, and everything about the trial is absolutely fair and first class, a grave injustice would be done the furnaceman.

As between the desire to test the iron by remelting, and the necessity to do this fairly, it becomes a difficult matter to specify just how to go about this. In fact one might think the whole proceeding somewhat radical, were it not for the fact that in the testing of cement the very same problem had to be encountered. Here it became a necessity that some standard sand be used to mix with the samples of cement to be examined, thus enabling experts in various parts of the world to make comparable tests. This selection of a standard sand is now being brought about, and shows that it will not be an impossibility to select a standard coke, a standard cupola, blast pressure, etc., for the testing of pig irons by remelting.

There would be, then, two things to be considered: First, the drawing up of standard specifications under which tests by remelting should be made, up to and including the preparation of the actual test bars for the comparative tests; and, secondly, the specification of the test irons, thus remelted, should be asked to pass. It is this latter point which causes your committee the difficulty, for the makers of the special grades of castings who would be only too glad to avail themselves of such a method to secure the highest grade irons for their work, are at the present time unable to assist your committee with the information necessary for this purpose.

We would, therefore, suggest that the whole subject be left an open one, and that we may be allowed to report whenever we have something tangible, suggesting in the meantime that the makers of rolls, furnace irons, car wheels, pipes, malleables, cylinders and other special machinery castings, experiment along lines in remelting and testing best suited to their requirements, and keep your committee informed of their needs. In this way there will soon be something throwing light upon the one urgent requirement of the foundry industry tending toward a better and more uniform product.

F. Conlin, Chairman of the committee on insuring patterns, stated that owing to the crowded condition of the foundry industry but little more than preliminary work could be done during the past year. The insurance interests, as represented by the National Board of Underwriters, have been very cordial in their dealings with your committee, everything pointing to a complete and equitable solution of the problem, thus assuring our foundrymen on the one hand prompter adjustment in case of losses, and the insurance interest, on the other, a tangible basis upon which these adjustments can be properly and fairly made.

J. S. Seaman, reported that, as the work of the committee on foundry trade school hinged on the Carnegie technical school movement in Pittsburg, the waiting attitude of the latter project left little to report. The money to build the school and the necessary endowment were ready and legislation had been passed providing public funds for the site; but the legality of the action on this last matter had been questioned, and politics had come in to delay action, the purchase of the site having been made in pursuance of an act appropriating money for park purposes.

In connection with the foundry trade school secretary Moldenke raised the question whether the preparation of instruction leaflets dealing with practical problems of the foundry, and their distribution among ambitious workmen,

would not contribute to the raising of the standard of proficiency. He suggested that possibly such a work might be carried on under association auspices.

A motion was adopted that a committee should be appointed to take up original investigation for the purpose of overcoming difficulties in foundry practice in accordance with a suggestion made by Stanley G. Flagg, of Philadelphia. Mr. Flagg was designated as chairman of this committee, while the other members are to be appointed later.

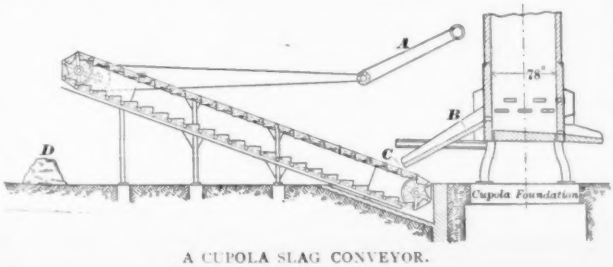
Mr. West stated that what he considered the bane of the foundry of today is the smattering information which so many foundry workers have in regard to their trade. He believed that a trade school of the right character would help to solve the problem of incompetent foremen and workmen. Much of the present day friction and many unbearable conditions imposed upon employers he considered arose from the fact that many men in charge of foundry operations are not practical.

The last feature of the morning session was the following paper by Thos. D. West describing

A New Cupola Slag Conveyor.

In melting over 50 tons of iron in cupolas above 50 inches inside the lining, there is more or less slag formed which must be taken from the cupola. Some founders allow this slag to accumulate below the slag spout, while others prefer to convey it some distance away. To do this the slag is often let run down a sand or iron runner as far as it will flow, and is then pulled away with a hook for a certain distance, while in a semi-molten state. Other founders allow the slag to run into small buggies which can be handled by one man. Again the slag may be let run into a car which is sent to a dump pile over a regular track.

Believing that present methods could be improved, that money could be saved, besides doing away with disagreeable labor and aiding our continuous melting system, we decided to install a slag conveyor as shown in the illustration which was gotten up by the C. O. Bartlett & Snow Co., of Cleveland, Ohio. While it might be thought a rather elaborate and costly machine, nevertheless, as we are making radical changes in our methods of molding and casting, and are arranging for the continuous melting of 20 to 22 tons per hour, or from 480 to 528 tons daily for each week's steady run, when not using hot metal direct from the blast furnace, we consider the machine a good investment.



A CUPOLA SLAG CONVEYOR.

In operating the slag conveyor, the belt "A" serves to start and stop it. The slag as it runs from the cupola flows down the spout "B" into the buckets "C." The buckets convey the slag outside the shop, dropping it from them in solid form, into the car, cart, or pile "D." The blocks, after they are sufficiently cool, may be broken up to pick out the iron which has been carried out with the slag. We have a method in view which contemplates gathering the iron before dropping the slag into the car. This will then save the labor connected with the slag question in any form.

When it is considered that slag may contain shot iron up to 4 per cent. as well as oxide of iron up to 15 or 20 per cent. aside from what iron may run out through the slag hole, the importance of gathering all the metallic iron possible may be seen. Then again, as the amount of slag produced is from 30 to 50 lbs. per ton of iron melted, the slag made by our projected daily heats would be from 19,000 to 25,000 pounds from which the importance of the new slag conveying system we are installing may be readily judged.

Tuesday Afternoon.

At the opening of the Tuesday afternoon session Jos. Leon Gobeille, of the Gobeille Pattern Co., Cleveland, Ohio, gave a very interesting and practical talk upon the organization, maintenance and management of a modern pattern shop. The speaker took up the many important details connected with the economical production of patterns and described several special tools designed to facilitate work. Mr. Gobeille advised foundrymen whose shops are near one another to combine in the establishment of a pattern shop to

furnish patterns for all of them, stating that a combination of work of this character, which would enable it to be done on a larger scale and under systematic arrangement and supervision would enable them to reduce the cost of their patterns by fifty per cent.

At this point the meeting organized as the foundry foremen's section of the association with A. M. Loudon, as the presiding officer. Papers were read on the following subjects:

"The Continuous Operation of the Iron Foundry," by J. C. Knoeppel, Oswego, N. Y.; "Foundry Responsibility," by F. W. Stickle, Hyde Park, Mass.; "Foundry Management," by David Spence, Chicago, Ill.; "Permanent Molds," by Jas. A. Murphy, Erie Pa.; "Molding Machines," by Edward B. Gilmour, Peoria, Ill.; and another on the same subject by S. H. Stupakoff, Pittsburg, Pa.; "Trials of a Foundry Foreman," by A. M. Loudon.

Edward Richelieu, of Omaha, Neb., contributed the following note on

Continuous Molding.

I was very much interested in a recent paper of Dr. Moldenke in which he discusses the eight-hour day, calling it a good move on the part of the foundry, provided there were three of these days in the 24 hours. This recalls my experience in a London shop in which I spent a number of years. Here everything was ready to start molding at once, and nothing was required of the molders but molding. Helpers weighted the flasks, had the fires ready for skin drying and kept pace with the molders to the completion of the mold. Where shank ladle work was made the iron was brought to the floor, and if the helper was trusted he was told to pour. As a rule the helpers were entrusted with almost everything in this jobbing shop, and it left the molders to devote practically all their time to molding. Good rigs were provided, and the molders were well satisfied and put up a good day's work. It was not necessary to go around the shop to give lifts, for enough help was provided for the purpose.

In connection with continuous work I will cite an instance where not only work in quantity was produced, but a great saving in flasks and patterns was effected. The job was making 4-inch pipe. Ten flasks and one pattern only were provided. Three molders in one gang molded up 30 pipes by piece work. Then a gang of three more men came on and made 30 more pipes, and finally the last three men came on and finished up the 90 for the day's work of 24 hours. This shows what can be accomplished in the way of continuous production with a minimum of equipment.

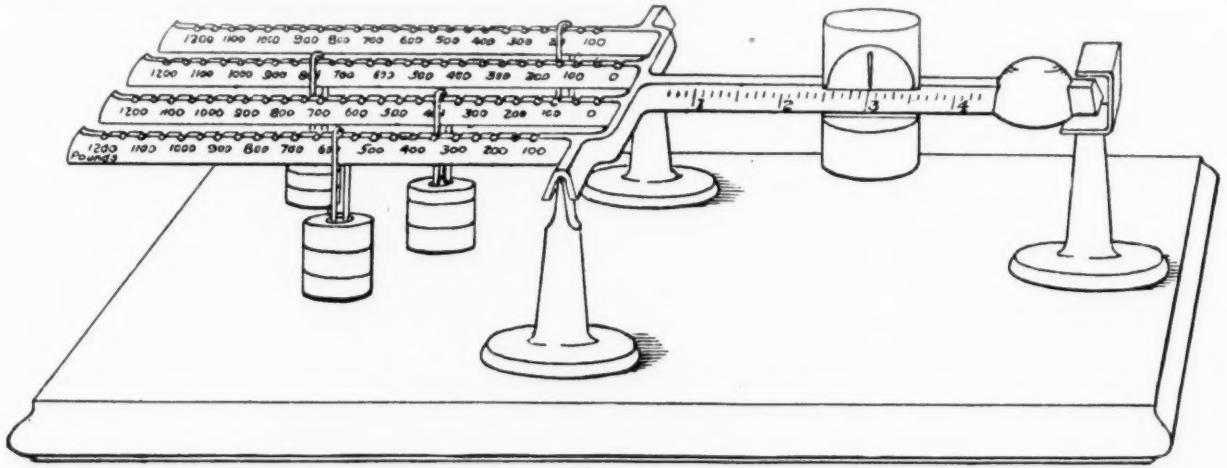
Foundry Control.

To the question "Is it an Advantage to a Foundry to place the Cupola and Metallurgical Operations under the control of some one other than the Foundry Foreman?" Robt. P. Cunningham responded as follows:

In my opinion the responsibility for the conduct of a foundry should not be divided and the chemist should either be placed under the foreman or the foreman should be subject to orders from the chemist. I think that the best results are obtained where the foundry foreman is at the head and everyone in or about the shop is under his control. This is due to the fact that there should be only one person to look to for orders. When the responsibility is divided it is always the other fellow who is to blame whenever anything goes wrong. Again a set of shop employes are more apt to lose their respect for the foreman when they find out that someone else has anything to say about the management of the works, when they are inclined to look for authority from the quarter that promises them the most privileges. No body of workmen can be governed by two persons any more than an army can be successful if it is commanded by several generals, each having the same power. No two men can think alike in all things, and for these reasons I claim that a foundry foreman should have full control of the foundry and be given full power to manage it as he deems best and to him should be given the credit for its success or censure for its failure.

Mr. Loudon called the attention of foundry proprietors to the advantages which would follow if their foreman could become better acquainted with what is taking place in the shops outside of those over which they preside and felt that on general principles the foundry foreman should be given more encouragement in this direction than is at present the case. He said in part:

In days gone by the owner of a foundry was generally a man who had worked himself up from the bottom and who was therefore intimately acquainted with most of the details connected with the trade. It was nothing uncommon for him to pull off his coat and set the day's work on a job or show a molder how he could handle himself to better advantage.



DEVICE FOR ASCERTAINING THE AVERAGE SILICON IN AN IRON MIXTURE.

With larger shop organization this type of proprietor has passed away and today the larger foundries depend mostly upon foremen to see that they are operated to the best advantage.

It is important to them then that their foremen shall have a broad knowledge and nothing will promote this to a greater degree than to meet others holding similar positions and honestly discussing ways and means by which shop difficulties may be overcome and methods in vogue improved. The man who stays in one shop year after year without being afforded a chance to learn what his neighbors are accomplishing, soon has his mind traveling in a narrow groove, harmful to himself as well as to the concern who employs him.

I feel that I may well ask the employers to encourage their foremen to affiliate with us. Our aim is to improve ourselves and in doing so we can not fail to benefit those over whose shops we preside and who look to us to keep them on a dividend paying basis. More than one foundryman may believe that he has the smartest foreman on earth, and the foreman himself may share in this belief, yet it is a fact that all of us need to learn more in one particular or another.

A foreman, to be competent today, has to know more, than he ever did before. His employer may furnish the very best of equipment, but it requires a central head to utilize this before it can be made to yield the greatest returns. The foundry owner at the present time as a rule has all he can do to attend to the commercial end of the business without adding to his care the time required to give attention to shop details. Therefore any assistance he lends his foundry foreman to keep up with the times makes the manufacturing end of his business more effective.

Mr. Arthur W. Walker, of the Walker & Pratt Mfg. Co., Watertown, Mass., read the following paper describing

A Simple Device for Ascertaining the Average Silicon in an Iron Mixture.

The device consists of a balanced scale, having a single beam on one side of the fulcrum, as shown in the sketch, and any number of beams on the other side; in the illustration there are four of these beams, which are shown

on the left of the supports. For the scale beams on the left side, small weights are used, each weight representing a certain kind of iron, and the weight being varied to represent the percentage of silicon contained in the iron which it represents.

In the scale which we are using each ounce in the left hand weights represents one per cent of silicon, and the weights can be arranged by adding weights of various amounts, so that they will correspond to the percentage of silicon in the various irons used, each weight representing one kind of iron.

Having arranged the weights in conformity to the percentage of silicon in the various irons, the weights are placed in position on the left hand scale beams in accordance with the quantity of each iron which it is intended to use. The instrument we are using is designed for a net ton, or 2,000 pounds. As shown in the sketch the weight on the front scale beam is set at 600 pounds, indicating that for that particular iron it is proposed to use 600 pounds in a net ton. On the second beam the weight is set at 400 pounds, indicating that 400 pounds of that iron will be used. On the next beam the weight is set at 800 pounds, and on the rear beam the weight is set at 200 pounds. It will be noted that these weights make 2,000 pounds in all. Having placed the weights in conformity with the proposed mixture, the right-hand weight is moved along the scale, until it balances the left-hand weights, and when the right-hand weight exactly balances the others, its position on the scale indicates the average silicon. From this may be deducted the expected loss in silicon (say one-quarter of one per cent) or the right-hand weight can be made to allow for this without any figuring whatever.

It is obvious, of course, that the instrument may be used in the opposite way from the above, setting the right-hand weight at the silicon desired, and then adjusting the left-hand weights until they balance, remembering that the total must always be 2,000 pounds for the left-hand weights.

If it is desired to ascertain the mixture in a charge larger or smaller than 2,000 pounds, it is only necessary to change the large weight on the right-hand beam. In the device we use, this weighs ten ounces, and for a charge of say, 1,200 pounds, it would be changed for one weighing six ounces.

There is, of course, no objection to placing two or more of the weights on the left-hand scale; indeed, a single scale on the left would serve for all the different weights used; it is thought that the use of a number of scale beams makes the device easier to use and understand.

The instrument can also be used to determine the average of any other element in the iron.

Tuesday Evening.

On assembling Tuesday evening the following paper on "Retort Oven Coke for Foundry Use," by W. J. Keep, of Detroit, was read by W. S. Blauvelt, of the Solvay Process Co., Detroit, who also answered questions concerning foundry experience with by-product coke made in Semet-Solvay ovens.

Retort Oven Coke for Foundry Use.

My excuse for saying a few words on this subject is that for a year and a half I have used retort oven coke exclusively, melting about 80 tons of iron per day. I have used coke made at three different plants, from Hamilton, O., Sharon, Pa., and Detroit. This coke was made from a great variety of coals from West Virginia and Pennsylvania. The coke used during 1902 was made in Detroit and was uniformly good. At times during January and February of this year we received some coke that was not satisfactory, because the makers could not procure proper coal owing to transportation difficulties. When this condition changed the coke again became satisfactory and has continued to be so.

During these same early months of 1903 founders all over the country had trouble with coke from bee-hive ovens. Founders in many parts of the country were obliged to take any kind of coke that they could get in order to keep running. During the past season most of the best deposits of coking coal in the Connellsville region have been purchased by the United States Steel Corporation, and very little genuine Connellsville coke is available for general foundry use. It may be interesting to describe in a few words the old-fashioned bee-hive oven and the newer retort oven.

The bee-hive oven takes its name from its interior, having the shape of the old dome-shaped bee-hive. The size is generally from 8 to 12 feet in diameter and from 6 to 8 feet high. The coal is charged through a hole

DYE, GORDON AND KANAVEL TAKE UP THE SAND QUESTION
AT THE SOLDIERS HOME
GOMERSALL LOUDON & THOMAS TALK OVER THE FOUNDRY FOREMAN'S TROUBLES
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CONVENTION
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SAM T. JOHNSTON ENTERTAINS MR. GOBEILLE AND A FEW FRIENDS
PRIVATE
THE EXCURSION TO WEST ALLIS

in the top and is spread evenly over the floor to a depth of 18 to 28 inches. There is as much space left over the coal for the burning of the gases as is occupied by the charge of coal. The brick work of the oven being still hot from the heat of the previous charge, soon causes the fresh charge to ignite and distill off the gases, which are burned in the dome above the coal. The heat being reflected downward causes the distillation to proceed gradually toward the bottom of the coal. When all the gas is driven off, which takes from 48 to 72 hours, the coke is quenched while yet in the oven.

The bright glistening surface of Connellsville coke is principally due to this quenching inside the oven, and the columnar structure is due to the gas rising vertically as the coking proceeds downward. Blackheads are the lower portions of the charge that rest on the floor of the oven and which are not thoroughly coked.

As in this method of coking the only product obtained is the coke, and owing to the combustion taking place in the oven itself the yield of coke is generally somewhat less than the theoretical, owing to the combustion of a small quantity of the fixed carbon of the coal.

The retort oven is a closed chamber from 15 to 24 inches in width and from 5 to 8 feet in height, and from 25 to 45 feet in length. From 25 to 50 of these ovens are placed in a battery. The coal is charged through three or more openings in the top and leveled off to within a foot of the roof, after which the oven is carefully closed and sealed in order to exclude the air. The oven is heated by the combustion of a portion of the gas driven off in the process of coking. This is not burned in the oven itself, but is burned in flues constructed in the walls of the individual ovens. The heat is conducted through the walls of these combustion flues to the charge of coal, and distillation thereof is started immediately. The gas which is driven off is conducted through a series of apparatus in which the tar and ammonia are recovered, after which a portion of the gas is returned to be burned in the oven flues and the balance is disposed of as local conditions determine.

Distillation proceeds from the side walls toward the middle of the oven and the gas is probably driven toward the center of the oven, where it rises, forming a cleavage plane the whole length of the oven. When the process is completed, which takes place in from 20 to 36 hours, depending upon the width of the oven and the temperature maintained, the whole charge is pushed out by a steam or electric ram and is immediately quenched. The oven is at once closed, and without any loss of heat from the oven itself, is again charged with coal.

On account of the cleavage plane through the center of the charge, no piece of coke can be longer than half the width of the oven. Owing to the complete exclusion of air there is no combustion in the oven, and as the temperature of the oven when the coal is charged is very high, there is a considerable decomposition of volatile matter, with consequent deposition of carbon upon the coking charge; as a result the yield of coke is a little higher than the theoretical yield as calculated from the analysis of the coal. Quenching the coke outside the ovens mars the appearance of the coke, somewhat destroying its bright silvery luster, but probably results in carrying off an appreciable quantity of sulphur.

It is evident from a comparison of these two methods that coke made from the same coal will have a slightly higher percentage of fixed carbon and a slightly lower percentage of ash if made in a retort oven. The bee-hive oven is almost universally located at the mines from which it draws its supply of coal. Retort ovens are located in places that provide a market for the coke and gas. To allow a continuous operation of a retort-oven plant the product must be sold as fast as made, and to do this a uniform quality of foundry coke must be maintained.

The quality of retort-oven coke depends upon the skill of the operator, upon the method of preparing the coal, and, more than all, upon the quality of the coal used.

Our experience with retort-oven coke began during the fall of 1901. We were at first induced to try one car, and when it arrived it was so black and in such small pieces and looked so badly that we refused to try it in a cupola, but the makers proposed to pay for all poor castings, and under these conditions we used it in the same proportion as the Stonega beehive coke that we had been using previously. The iron was very hot and satisfactory.

We ordered five cars more, and ordered retort-oven coke from other ovens, until we

decided that the coke worked well in spite of its very bad appearance. From that time to this we have never had a pound of other coke. All through 1902 the coke was so uniform and satisfactory that we melted 9 pounds of iron with 1 pound of coke.

There is a great advantage in having a local retort-oven coke plant, because it enables the founder to keep in close touch with the source of his supply. Owing to the necessity of having a laboratory at a retort-oven plant to keep track of by-products, the coke manufacturer keeps himself informed as to the chemical composition of his coal and coke and can make a very uniform product. Such a local coke plant will have a very large variety of customers, and therefore can supply the founder with a very uniform quality of coke, because any inferior coke can be sold to domestic users or to manufacturers where it will do no harm.

Experience has proven that with a retort oven satisfactory foundry coke can be made from coal that when coked in a bee-hive oven would be unfit for foundry use. This helps the founder in that it greatly widens the field from which he can draw his future supply of fuel. Retort ovens are at present being created in various cities, and I understand that an 80-oven plant will be in operation in Milwaukee in a few months. This will be a great relief to the founders of that city.

An interesting discussion followed the reading of Mr. Keep's paper. Mr. Blauvelt was asked if there were not more moisture in retort oven coke than in beehive coke, and answered that while moisture might be noticeable in the case of the former, this was not due to the retort process, but rather to the original coal. Connellsville coke made in beehive ovens is apt to be glazed and does not absorb moisture; coals from other districts do not glaze in this way, either in beehive or retort ovens. The question of burden-bearing quality being raised, Mr. Blauvelt said that this depended both on the kind of coal and its treatment in coke-making. A stronger coke will be made in the retort oven than from the same coal treated in the beehive oven. The narrow, confining chamber of the retort oven results in a compression from the sides, of the coal when in plastic condition under the coking operation. Highly volatile coals thus come out a much stronger coke than might be expected from their composition. However, there are great differences due to the character of the coal used.

Mr. West said that in his experience retort coke gave best results under a slight lowering of the blast pressure in the cupola. Mr. Magee, of Boston, told of the satisfactory use in stove work of German by-product coke, which he had been able to buy delivered in New England at 50 cents a ton less than American coke. Even since prices of domestic coke have receded, this foundry has placed an order for 500 tons of German coke in view of the good results attained.

Other papers presented at this session included "Notes on Estimating Methods," by Wm. Hanson; "Malleable Cast Iron," by Richard Moldenke; "Employer and Employe," by S. H. Stupakoff. S. S. Knight, manager of the Birmingham Pipe & Casting Co., Birmingham, Ala., delivered an address on the "Principal Factors of the Iron Industry in the Birmingham District," and showed views of ore properties, coke ovens, blast furnaces and steel works representative of the iron and steel trade in the South. W. H. Carrier, of the Buffalo Forge Co., Buffalo, N. Y., read a paper on the "Heating and Ventilating of Foundries and Machine Shops."

Wednesday Morning.

The metallurgical section of the association took charge of the Wednesday morning session, R. F. Flintermann presiding. Papers were read on the following subjects: "The Metallurgical Engineer in the Foundry," by Henry Souther; "Loss of Sulphur in Cast Iron Borings," by W. E. Dickson; "Blast Furnace Conditions Affecting the Chemical Condition of Foundry Iron," by W. Walley Davis; "Buying Pig Iron on Specification," by Herbert E. Field.

In a discussion on the recovery of nickel from scrap anodes used in nickel plating, A. K. Beckwith stated that while the usual practice is to melt such scrap in crucibles, his company had fitted up a cupola for this purpose. Nickel being more infusible than iron required considerably more coke. On the bed the ratio of coke and metal was 1 to 1; in the charge, 2½ of metal to 1 of coke. The custom was to melt 500 pounds at a heat. In the operation of which he presented the figures, there had been melted 825 pounds of scrap, and two heats were

required. The bed had 200 pounds of coke and 200 pounds of nickel scrap; in the charge there was 40 pounds of coke to each 100 pounds of scrap. The 875 pounds of scrap was worth $218.75; 640 pounds of coke cost $2.25; molder's work, $3; a laborer, $2. Total cost, $226. The yield was 635 pounds of nickel anodes, at 50c, or $317.50. In addition there was 75 pounds of scrap at 25c, or $18.75. The total received was $336.25, making the profit in the operation, $110.25.

Wednesday Afternoon.

Wednesday afternoon the visitors were given an opportunity to inspect the new works of the Allis-Chalmers Co., located at West Allis, one of Milwaukee's suburbs. This is one of the modern foundries of the world, possessing so many points of interest that a long article would be necessary to describe all. Among the features which attracted great attention were the electric traveling jib wall cranes, capable of handling loads up to 5 tons in weight, thus relieving the large overhead traveling cranes of much work of a lighter character. The arrangement for weighing and handling cupola charges was also observed with the keenest attention, including as it does labor-saving appliances of the most approved type.

On Wednesday evening the Milwaukee foundrymen tendered the visitors a smoker in the dining room of the Hotel Pfister. A pleasant entertainment was enjoyed.

Thursday Morning.

The Thursday morning session was given over to business matters entirely and the election of officers. H. E. Field, of Ansonia, Conn., presented a motion, providing for the appointment of a committee to take up the question of preparing instruction papers for distribution among the employes and apprentices of members of the association, which was adopted. Mr. Field was appointed chairman with power to select his own committee.

Wm. Yagle, chairman of the committee on nomination of officers, presented a report, which was unanimously approved, naming the following list of officers, all of whom were duly elected:

President, Willis Brown, Walker Foundry Co., Erie, Pa. Vice president—First district, John Magee, Magee Furnace Co., Chelsea, Mass.; second district, J. A. Beckett, Hoosick Falls, N. Y.; third district, John McLaren, Phillips & McLaren, Pittsburg, Pa.; fourth district, A. K. Beckwith, Estate of P. D. Beckwith, Dowagiac, Mich.; fifth district, C. J. Wolff, L. Wolff Mfg. Co., Chicago; sixth district, Adam W. Bair, Chicago, Milwaukee & St. Paul Railway Co., Milwaukee, Wis.; seventh district, J. P. Golden, Golden's Foundry & Machine Co., Columbus, Ga.; eighth district, T. J. Best, Warden King & Son, Montreal, Canada; secretary and treasurer, Dr. Richard Moldenke, New York City.

The same committee also made the following recommendations which were approved: That Charles H. Thomas, Newark, N. J., be made chairman of the Foremen's Section and James A. Murphy, Erie, Pa., secretary; that W. G. Scott, Racine, Wis., be made chairman of the Metallurgists' Section, and H. E. Field, Ansonia, Conn., secretary; and that Mr. Field be selected by the executive committee as assistant to Secretary Moldenke.

The Associated Foundry Foremen.

The foundry foremen, maintaining a separate organization and in certain directions acting as a section of the A. F. A., held an executive session in the club room of the Hotel Pfister during the evening of June 8th, at which the following questions came up for discussion:

Is it an advantage to a foundry to place the cupola and metallurgical operations under the control of some one other than the foundry foreman?

Do our larger foundries employ a sufficient number of foremen?

Do you find analyses, as furnished by blast furnaces, trustworthy?

In your opinion, are there any special advantages in the continuous operation of a foundry? Is the output of molders working overtime equal to that produced during regular working hours?

What can be done to insure harmonious relations between foundry and pattern departments? Are stated meetings for heads of departments desirable?

Do you know a simple system of shop orders for foundry use, by which delays are avoided in pattern, flask, molding and core departments, and through which the progress made upon job is readily ascertained at any time?

How can the foundry foremen best serve

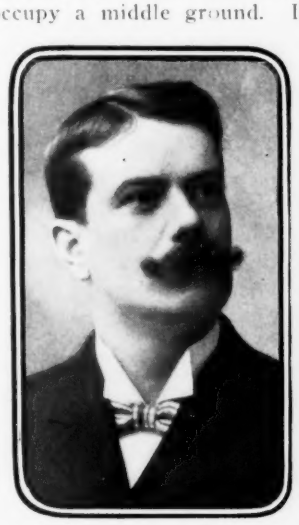
the interests of the industry through united effort?

The general opinion appeared to be that where a competent metallurgist is employed he should relieve the foundry foreman of responsibility in connection with mixtures and leave the latter free to devote his full time to molding. It was conceded by all that the modern foundry needs the aid of the analyst to secure the best results. One of the metallurgists present suggested that where the size of the plant warranted such a course, excellent results would follow the placing of all metallurgical operations under the control of the superintendent, confining the sphere of the foreman to actual molding operations and having the chemist occupy a middle ground. It was pointed out by the same speaker that it is absolutely necessary that the chemist must learn to supply the needs of the foundry and that he should be trained in a responsible institution. One of the foremen took the position that at the present day it is simply a question whether the foreman will fit himself to take full charge and assume full responsibility. In his opinion there could be no division of the latter and if necessary the foreman should be given more assistance, including that of a chemist.

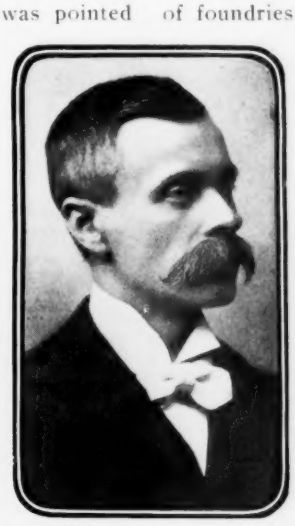
Relating to the employment of a sufficient number of foremen in the larger shops it was pointed out that the responsibility for proper supervision rested with the superintendent or general foreman, although the latter might at times dislike to ask for additional assistance from the company. Modern shops are realizing that they must have a sufficient number of foremen to look after shop details.

The majority of those present stated that furnace analyses are fairly reliable, especially where it is known that these are rechecked occasionally. One of the chemists present took the opportunity to call attention to the fact that while the majority of furnaces make it a practice to analyze each cast for silicon and sulphur, it is the average analysis for the period of a day which founders generally receive.

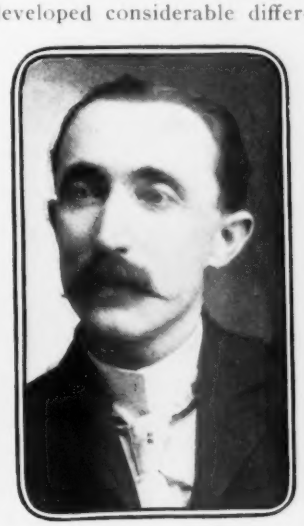
Discussion as to the continuous operation of foundries developed considerable difference of opinion. On the larger class of castings the chief objection appeared to be that with several different sets of men working on the same job there would be difficulty in placing the responsibility for loss upon any one in case of accident. It was recognized that for standard work, and especially for light castings, there were certain advantages in operating a plant continuously. On general principles the doubling up of molders on the same job and the working of overtime was not deemed good practice where this could possibly be avoided, as the output secured in both quality and quantity was superior when obtained in regular daylight working hours, with every man taking



CHARLES H. THOMAS,
President.



EDW. B. GILMOUR,
Vice-President.



JAS. A. MURPHY,
Secretary and Treasurer.

OFFICERS OF THE ASSOCIATED FOUNDRY FOREMEN.

increased pride in work which was his individually.

Another question brought up at the meeting read: "Is it justice to a firm for molders not in a heat to stop working when casting begins?" The statements made showed that considerable difference exists with localities and that in many parts of the country it is the custom for molders to put in a full day at molding when they have no work of their own to pour off and are not called upon to assist others. In other sections it is the practice for molders to consider that their day's work of molding ends as soon as the blast goes on. One foreman remarked that the easiest way to overcome questions of this kind was to grant increased pay to rapid workmen, mentioning the fact that while the rate of pay in the shop with which he was connected was $3.25 for 9 hours, the average daily earnings of all molders were $4.33.

The setting of a day's work also received some attention from the foremen. The practice of one shop where the molders settle this matter for themselves by agreeing to mold certain castings within a specified time, and receiving full pay for all time they manage to save, was commented upon.

The election of officers of the Associated Foundry Foremen resulted in the selection of Charles H. Thomas, Newark, N. J., as president; Edward B. Gilmour, Peoria, Ill., vice-president; James A. Murphy, Erie, Pa., secretary and treasurer.

Convention Echoes.

The season's crop of yarns more or less related to the foundry business has been gathered and found fully up to the average.

The absence of J. D. Smith and J. S. McCormick was said to be due to the arrival of a cargo of plumbago off Sandy Hook, which each desired to corner.

Great excitement prevailed when it was whispered about that one of the foundrymen was having a job of manicuring performed. Fortunately, the rumor was found to be without foundation.

They say that the good people of Philadelphia do not yet know that there has been a foundrymen's convention held since 1896.

Miss E. F. Jones, manager of the Preble Machine Works, South Chicago, will always find a royal welcome awaiting her at the foundrymen's gatherings. There is room for many more like her.

The custom of presenting visitors with permanent souvenirs seems to have degenerated until it is now largely a question of who can give the most matches away. There are some hustlers among the supply men when it comes to distributing this form of advertising matter.

Henry E. Pridmore of Chicago, L. S. Brown of the Springfield Facing Co., Springfield, Mass., and the Coburn Trolley Track Co. of Holyoke, Mass., distributed among their friends and customers a few useful tokens which will be retained for a long time to come.

No catalogues of foundry equipment were in evidence in the parlor occupied by Sam T. Johnston, of the S. Obermayer Co., and yet he did not seem to suffer for the want of company. It was noticed, too, that visitors emerging from this part of the house bore a peculiar smile, a fac-simile of the one that won't come off.

Three years ago it required two baggage cars filled with refreshments to carry the foundrymen through an afternoon's trip to the drainage canal at Lockport, Ill. Well, it is no use making comparisons, but at any rate we can legally claim that we are becoming more conservative. Whether this is our own fault is another question.

David Evans, of the Field-Evans Iron Co., may not have had as many years' experience in selling pig iron as others, but there is no gainsaying the fact that he has a knack of making himself a good fellow whenever the opportunity occurs. A great many foundrymen fell into the habit of dropping into his parlor for a few minutes' rest several times each day during the convention, and there was always a soft spot for them upon which to land.

The fact that J. Frank Dye, of the Newport Sand Bank Co.; F. E. Gordon, of the Ohio Sand Co., and U. E. Kanavel, representing E. M. Ayers, of Zanesville, Ohio, were seen to walk arm in arm through the hotel corridors and otherwise spend much time in each other's company, gave rise to the rumor that there would be less competition in the molding sand business in the future. Fears were entertained by many of the foundrymen that they would no longer be able to obtain the foundation of their business below cost, but Mr. Gordon assured them that these were groundless, and that as long as he could manage to find a

MISS JONES'S POINTERS ABOUT THE
GEO. GOULD EXPLAINS WHY STANDARD OIL STOCK IS DOWN
WELCOME A.F.A.
SOLDIER'S MONUMENT
HOTEL PFISTER
DAVID EVANS MAKES MESSRS HYNDMAN AND BAUR FEEL AT HOME
THE CHARGING ARRANGEMENT AT WEST ALLIS ATTRACTS MUCH ATTENTION
THE LADIES GO FOR A DRIVE ABOUT THE CITY

few shallow veins of pay dirt in the northeastern part of Ohio this would be distributed to his friends at the cost of loading it on cars plus the freight rate. U. E. Kanavel denied that he had any intention whatever of making any money out of the red sand region in the vicinity of Zanesville, and Mr. Dye stated that for more than twenty years he had been distributing molding sand just for the fun there was in it, and could not think of doing business any other way. When these explanations had been made the excitement subsided and the crowd went over to another part of the house, where John Hill was telling a story.

The Attendance.

The following foundries were represented:

Yale & Towne Mfg. Co., Stamford, Conn., by P. F. Augenbraun.

C. M. & St. P. Ry. Co., Milwaukee, Wis., by Adam W. Bair, W. L. Shinafelt, E. H. Bair and John Taylor.

Wm. Bayley & Sons Co., Milwaukee, Wis., by Harry Bayley.

Warden King & Son, Montreal, P. Q., by T. J. Best.

Abendroth & Root Mfg. Co., Newburgh, N. Y., by E. R. Burroughs.

Gilson Mfg. Co., Port Washington, Wis., by H. W. Bolens.

Walker Foundry Co., Erie, Pa., by Willis Brown.

Dodge Mfg. Co., Mishawaka, Ind., by Harry L. Bell and F. P. Howlett.

Birmingham Machine & Foundry Co., Birmingham, Ala., by Andrew Banholzer.

Lane Mfg. Co., Montpelier, Vt., by J. J. Burger.

A. J. Lindemann & Hoverson Co., Milwaukee, Wis., by E. V. Coulston, C. H. Behling, A. J. Lindemann and F. Brownley.

Estate of P. D. Beckwith, Dowagiac, Mich., by A. K. Beckwith.

Mesta Machine Co., Pittsburg, Pa., by James Brown and F. E. Mesta.

Northwestern Malleable Iron Co., Milwaukee, Wis., by I. M. Bean, Wm. A. Draves and Fred'k W. Sivyer.

Wisconsin Malleable Iron Co., Milwaukee, Wis., by George C. Barth and John G. Coleman.

Brand Stove Co., Milwaukee, Wis., by Wm. Borek and W. F. Hyde.

Herendeen Mfg. Co., Geneva, N. Y., by E. K. Barr.

Michigan Heater Co., Big Rapids, Mich., by F. S. Cadwell.

Preble Machine Co., Chicago, by A. J. Charles, Miss E. F. Jones and John C. Manning.

Hewitt Mfg. Co., Milwaukee, Wis., by T. Cruice, W. L. Douglass and C. H. Schoff.

W. H. Knowles, Ottawa, Ill., by M. J. Cotter and W. H. Knowles.

Colorado Fuel & Iron Co., Pueblo, Colo., by Jacob Cowbiar.

Henry McShane Mfg. Co., Baltimore, Md., by James H. Comstock.

Colvin Foundry Co., Providence, R. I., by Theo. N. Colvin.

F. M. Prescott Steam Pump Co., Milwaukee, Wis., by Wm. Corbett.

Allis-Chalmers Co., Milwaukee, Wis., by Irving H. Reynolds, E. N. Dickson, Philip S. Dickson, A. P. Hauck, N. T. Harrington, A. E. Harrison, Wm. P. Harper, J. P. Harper, Joseph Harrison, R. S. McPherran, Edw. C. Search, W. G. Starkweather and S. L. Smith.

Western Electric Co., Chicago, by H. E. Diller and C. E. McArthur.

American Foundry Co., Rockford, Ill., by John E. Dowdakin and M. J. Green.

McCormick Harvesting Machine Co., Chicago, by Frank A. Ericsson, R. F. Flintermann and W. H. Kane.

Sandwich Mfg. Co., Sandwich, Ill., by Ezra Estep.

Hansell-Elcock Foundry Co., Chicago, by E. G. Elcock.

Harrisburg Foundry & Machine Co., Harrisburg, Pa., by S. H. Fisher.

Farrel Foundry & Machine Co., Ansonia, Conn., by Herbert E. Field.

Diamond Drill & Machine Co., Birdsboro, Pa., by W. E. Farrell.

Wm. Ferguson Foundry Co., Chicago, by Wm. Ferguson.

Falk Mfg. Co., Milwaukee, Wis., by G. Otto Falk, Clarence R. Falk, C. L. Jones, H. E. Mooney and E. A. Wurster.

Stanley G. Flagg & Co., Philadelphia, by Stanley G. Flagg.

Battle Creek Iron Works Co., Battle Creek, Mich., by Ben Gomersall.

The Bucyrus Co., South Milwaukee, Wis., by R. W. Grace and S. L. G. Knox.

M. Garland Co., Bay City, Mich., by Samuel S. Fair.

Acme Harvester Co., Peoria, Ill., by Edw. B. Gilmour.

Erie City Iron Works, Erie, Pa., by W. F. Grunau.

General Electric Co., Schenectady, N. Y., by Herbert M. Ramp and John Gow.

Golden's Foundry & Machine Co., Columbus, Ga., by J. P. Golden.

Greenlee Foundry Co., Chicago, by W. B. Greenlee and David Spence.

Greenslade Foundry Co., Milwaukee, Wis., by John Greenslade, Chas. Thielges and O. W. Greenslade.

Wm. R. Perrin Co., Chicago, by Chas. F. Goedke.

S. Green & Sons, Des Moines, Ia., by J. B. Green.

Condor Iron Foundry Co., Boston, Mass., by Y. E. Gibby.

Phœnix Mfg. Co., Eau Claire, Wis., by Anton Hanson.

Craig Foundry Co., Toledo, O., by S. W. Hawkins.

Advance Thresher Co., Battle Creek, Mich., by Wm. W. Hutton and Minard Lafever.

Henry J. Hartman, Grand Rapids, Mich., by Henry J. Hartman.

Geo. H. Smith Steel Casting Co., Milwaukee, Wis., by F. Hinners, Martin Rock, J. Geo. Shaw, Geo. H. Smith and A. W. Wagner.

Sheffield Car Co., Three Rivers, Mich., by G. Hokanson.

J. Thompson & Sons Mfg. Co., Beloit, Wis., by W. A. Jenkins and A. S. Thompson.

Campbell Gardiner Co., Milwaukee, Wis., by D. M. Jones.

Hoffmann & Billings Mfg. Co., Milwaukee, Wis., by J. B. Kalvalege.

Akron Foundry Co., Akron, O., by H. Jacob Krisher.

Krisher's Brass Foundry, Akron, O., by Perry A. Krisher.

Birmingham Pipe & Casting Co., Birmingham, Ala., by S. S. Knight.

Webster, Camp & Lane Machine Co., Akron, O., by A. F. Koons.

B. Hoffmann Mfg. Co., Milwaukee, Wis., by J. Kuhn, E. Kastner and A. Seelman.

J. M. Kohler's Sons Co., Sheboygan, Wis., by Walter J. Kohler.

Moline Scale Co., Moline, Ill., by John A. Kittilsen.

Lackawanna Iron & Steel Co., Buffalo, N. Y., by Frank Lightner.

J. B. & J. M. Cornell, Cold Spring, N. Y., by A. M. Loudon.

Syracuse Chilled Plow Co., Syracuse, N. Y., by E. J. Lambert.

Erie Foundry Co., Erie, Pa., by Adam W. Link.

Brown & Sharpe Mfg. Co., Providence, R. I., by E. J. Lyon.

Excelsior Foundry Co., Bay City, Mich., by W. H. Lefeire.

Westinghouse Air Brake Co., Wilmerding, Pa., by H. C. Loudenbeck and S. D. Sleeth.

Beaver Dam Malleable Iron Co., Beaver Dam, Wis., by D. P. Lamoreux.

Lane & Bodley Co., Cincinnati, O., by G. H. T. Lane.

Bettendorf Metal Wheel Co., Springfield, O., by H. Lamp and H. J. Rober.
Eaton, Cole & Burnham Co., Bridgeport, Pa., by Hugh McPhee.
Filer & Stowell Co., Milwaukee, Wis., by J. L. Monahan, T. J. Neacy, Walter Read and John Reardon.
Stillwell-Bierce & Smith-Vaile Co., Dayton, O., by Andrew Macduff.
Ball Engine Foundry Co., Erie, Pa., by Jas. A. Murphy.
Magee Furnace Co., Chelsea, Mass., by John Magee and I. Winchester.
Abendroth Brothers, Port Chester, N. Y., by John F. Mills.
Collins & Burgie Co., Marengo, Ill., by Richard T. Martin.
Pittsburg Steel Foundry, Glassport, Pa., by D. MacDougall.
Nortmann & Duffke Foundry Co., Milwaukee, Wis., by V. Nortmann.
Ridgway Dynamo & Engine Co., Ridgway, Pa., by Herman Nauert.
Chicago & Alton Ry. Foundry, Bloomington, Ill., by J. W. McNoldy.
Donaldson Iron Co.,Emaus, Pa., by John D. Ormerod.
Woolley Foundry & Machine Co., Anderson, Ind., by M. C. Perry.
Pattin Bros. & Co., Marietta, O., by W. S. Pattin.
J. I. Case Threshing Machine Co., Racine, Wis. by John Peebles, W. G. Scott and H. Walker.
Racine Steel & Iron Mfg. Co., Racine, Wis., by G. N. Prentis.
Crane Co., Chicago, by H. T. Quinn.
Stowell Mfg. & Foundry Co., South Milwaukee, Wis., by A. J. Ricker and C. E. Sammond.
Green Bay Foundry Co., Green Bay, Wis., by Jos. F. Rothe.
Sheriffs Mfg. Co., Milwaukee, Wis., by T. W. Sheriffs.
R. J. Schwab & Sons Co., Milwaukee, Wis., by R. J. Schwab.
Walker & Pratt Mfg. Co., Watertown, Mass., by Bartlett M. Shaw and Arthur W. Walker.
Wm. M. Crane Co., Peekskill, N. Y., by C. D. Shephard.
Roe Stephens Mfg. Co., Detroit, Mich., by Wm. Scott.
Seaman-Sleeth Co., Pittsburg, Pa., by J. S. Seaman.
Braddock Machine & Mfg. Co., Braddock, Pa., by G. C. Schade.
Hay Foundry & Iron Works, Newark, N. J., by Chas. H. Thomas.
Western Mall. & Gray Iron Mfg. Co., Milwaukee, Wis., by W. J. Turner.
United Engineering & Foundry Co., Youngstown, O., by Frank D. Taggart.
Sterritt-Thomas Foundry Co., Pittsburg, Pa., by J. D. Thomas.
Phillips & Buttorff Mfg. Co., Nashville, Tenn., by W. D. Trabue.
Vilter Mfg. Co., Milwaukee, Wis., by Theo. Vilter.
Foster, Waterbury & Co., Franklin Park, Ill., by Ed. S. Voelkel.
Thos. D. West Foundry Co., Sharpsville, Pa., by Thos. D. West.
Chicago Malleable Castings Co., West Pullman, Ill., by W. H. Williams.
Buckeye Malleable Iron & Coupler Co., Columbus, O., by Harry Wright.
Leland & Faulconer Mfg. Co., Detroit, Mich., by Joseph J. Wilson.
Wm. Yagle & Co., Pittsburg, Pa., by Wm. Yagle.

The following manufacturers of and dealers in foundry equipment and supplies were represented:

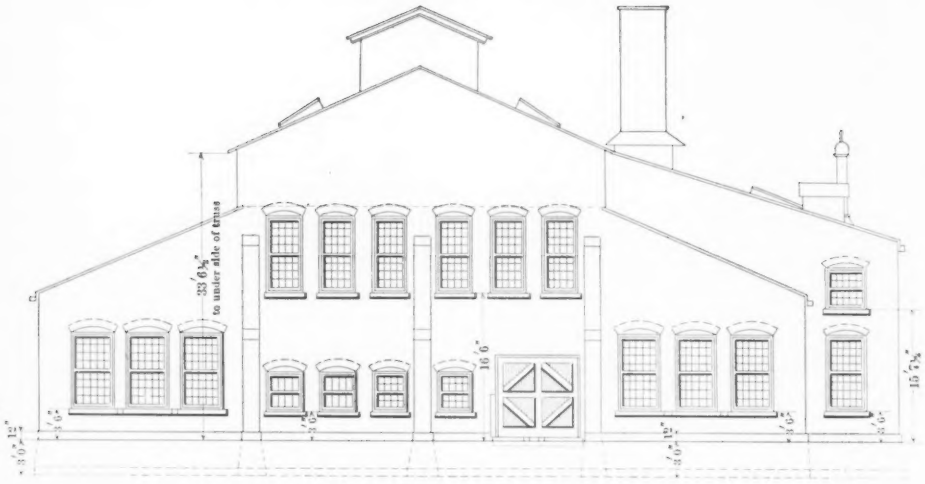
S. Obermayer Co., of Cincinnati and Chicago, by W. J. Adams, James E. Evans, Wm. Fitzpatrick, Sam T. Johnston and E. J. Woodison.
Matthew Addy & Co., Cincinnati, O., by E. T. Axner.
Standard Sand & Foundry Supply Co., Cleveland, O., by H. G. Boughton.
Springfield Facing Co., Springfield, Mass., by L. S. Brown.
Solvay Process Co., Detroit, Mich., by W. S. Blauvelt.
Taylor, Wilson & Co., Allegheny, Pa., by R. F. Barker.
Great Western Smelting Co., Chicago, by A. Benjamin.
Chicago Belting Co., Chicago, by E. H. Ball.
F. B. Stevens, Detroit, Mich., by Geo. F. Crivel.
Garden City Sand Co., Chicago, by Wm. Chambers and Chas. McNeal.
Buffalo Forge Co., Buffalo, N. Y., by W. H. Carrier.
Dings Electro Magnetic Separator Co., Milwaukee, Wis., by M. Dings.
Tabor Mfg. Co., Philadelphia, Pa., by J. W. Dopp.
Newport Sand Bank Co., Newport, Ky., by J. Frank Dye.
Henry E. Pridmore, Chicago, by D. F. Eagan, Henry E. Pridmore, E. H. Pridmore and R. E. Turnbull.
Edw. J. Etting, Philadelphia, by Frank M. Etting.
Field-Evans Iron Co., Chicago, by David Evans and Irwin McDowell.
J. D. Smith Foundry Supply Co., Cleveland, O., by Edw. Fahey and P. G. Smith.
Springlake Iron Co., Fruitport, Mich., by J. C. Ford.
The Thomas Furnace Co., Milwaukee, Wis., by J. F. Forsyth and John M. Thomas.
Pawling & Harnischfeger, Milwaukee, Wis., by Thos. Glasscock, H. D. Lattimer and A. Pawling.
Ohio Sand Co., Conneaut, O., by F .E. Gordon.
Gobeille Pattern Co., Cleveland, O., by Jos. Leon Gobeille.
Diamond Clamp & Flask Co., Richmond, Ind., by Wm. Gartside.
Hawley Down Draft Furnace Co., Chicago, by W. M. Green.
Hill & Griffith Co., Cincinnati, O., by John Hill.
Hickman-Williams Co., Chicago, by E. P. Hettiger.
Washington Coal & Coke Co., Pittsburg, Pa., by N. P. Hyndman.
Pickands, Brown & Co., Chicago, by E. A. Hyde.
E. E. Hanna, Chicago, by E. E. Hanna and H. M. Vance.
Jenkins & Reynolds Co., Chicago, by V. C. Hamer.
J. Howard Jones & Son, Chicago, by F. L. Jones.
T. P. Kelly & Co., New York and Chicago, by T. P. Kelly.
E. M. Ayers, Zanesville, O., by U. E. Kanavel.
A. M. Crane & Co., Chicago, by C. E. Louis.
National Electric Co., Milwaukee, Wis., by David McLain and Jas. R. Petley.
J. S. McCormick Co., Pittsburg, Pa., by T. E. Malone.
Chicago Fire Brick Co., Chicago, by W. H. McCarthy.
Coburn Trolley Track Mfg. Co., Holyoke, Mass., by H. S. Parks and Fred D. Thorpe.
Rowlands Machine Co., Racine, Wis., by J. T. Rowlands.
Whiting Foundry Equipment Co., Harvey, Ill., by W. A. Rider.
W. W. Sly Mfg. Co., Cleveland, O., by W. W. Sly.
Philip Schwab Machine Co., Milwaukee, Wis., by Philip Schwab.
H. S. Vrooman, Chicago, by H. S. Vrooman.
New Process Pattern Letter Co., Milwaukee, Wis., by A. Werner.
Dayton Coal & Iron Co., Cincinnati, O., by Sam H. Whittaker.

The trade papers represented were:

The Iron Age, by George W. Cope, W. A. Douglass and H. H. Roberts; *The Iron Trade Review*, by A. I. Findley and George H. Griffiths; *The American Manufacturer*, by S. A. McRoberts; *The Engineering News*, by E. E. R. Tratman; *The Foundry*, by Henry Hansen.

Production Checked at Pekin.

The cupola at the Duisdieker foundry has burned out and a number of men were laid off for today until repairs are made.—Pekin (Ill.) *Times*.

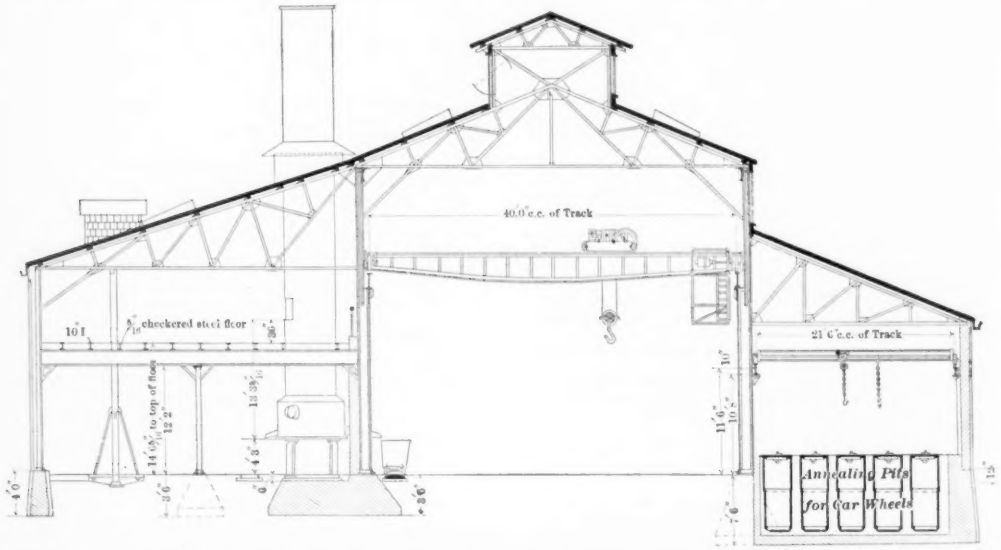


WEST ELEVATION OF FOUNDRY.

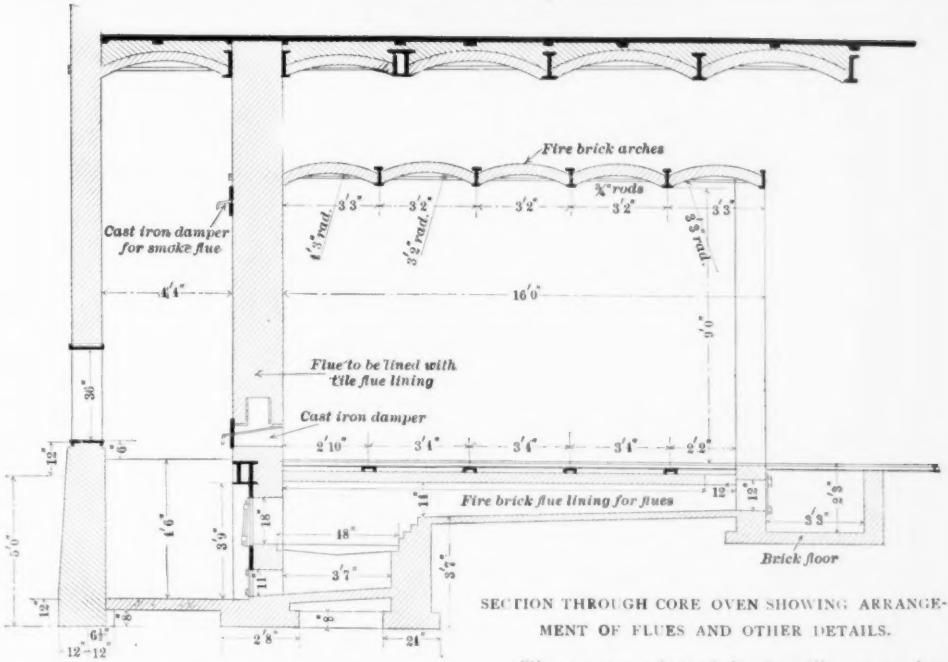
The New Foundry of the Sheffield Car Co. Three Rivers, Mich.

The Sheffield Car Co., at Three Rivers, Mich., has recently erected a new foundry from plans designed by Stevens & Blume, Architects and Engineers, Detroit, Mich. The dimensions of this are 250x90 feet, being a trifle wider across the cupola room. The building is divided into one main floor and two wings, the main floor being 40 feet wide and each side wing 25 feet wide. The main part is to be used as a general molding floor, while one wing is to be used exclusively for car wheels. The other wing will be occupied by cupolas, core room, wash room, laboratory, office, and the balance of the space is so arranged that it may be utilized as a molding floor for small castings, the intention being to install at this point a number of molding machines of various kinds. Fifty feet of one end of the building is to be used as a cleaning room and is separated from the main foundry by partitions running up about 20 feet so as to allow the cranes to pass over and cover the building from end to end.

Above the core room it has been arranged to store core sand, which will be carried up to this place by a bucket elevator as indi-



SECTIONAL VIEW THROUGH FOUNDRY.

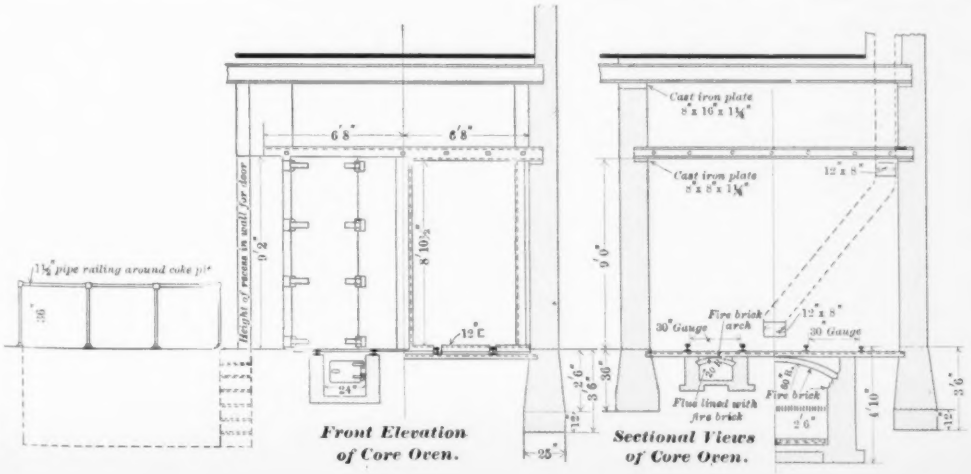


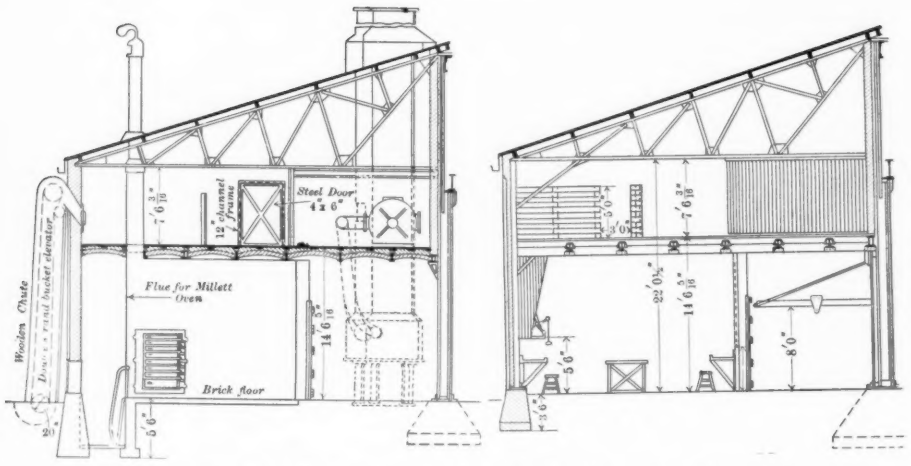
SECTION THROUGH CORE OVEN SHOWING ARRANGEMENT OF FLUES AND OTHER DETAILS.

cated in the illustrations. After being mixed this will be deposited on the core benches through chutes located along the wall. The facing sand will be mixed on the platform situated at one end of the building, and after being mixed and tempered here it is carried in dump cars by the cranes and distributed wherever wanted in the foundry. The main molding floor is served by a five-ton electric crane, while the wheel floors are covered by one electric and two hand cranes, and the core floor by a 2 ½-ton jib crane attached to a floor column in such a manner as permits it to swing clear around the same.

The system adopted for handling car wheels is one which permits of great rapidity. Of the three cranes in this department, one will handle the metal for pouring, the second one will follow and shake out the molds and remove the chills, while the third crane will carry the wheels to the wheel pits.

The foundry office has been located so as to allow the greatest possible view of the molding floor through the glass partitions surrounding the office. The two core rooms are also divided by a glass partition, the outside room being for making all the heavy cores, while the inside room will take care of the smaller ones. There are two core ovens, one



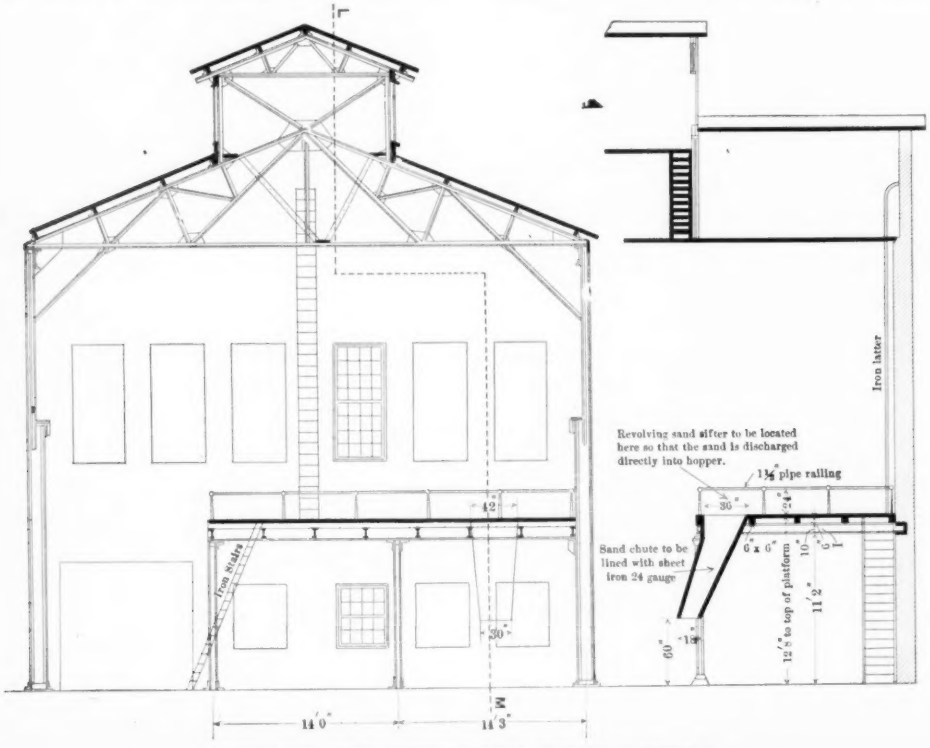


DETAILS OF ELEVATOR AND CONVEYOR SYSTEMS AND OTHER FEATURES.

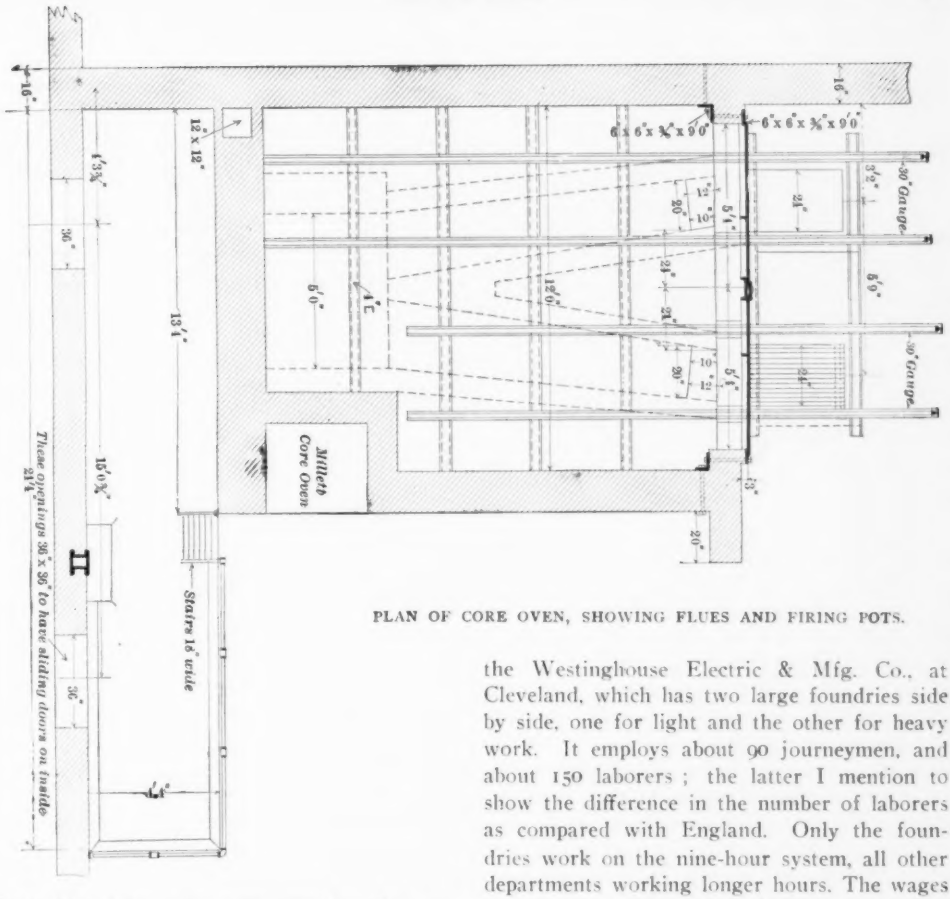
for heavy cores which have to be placed on cars, and one Millett core oven, opening into the room, for smaller cores. The cupola platform is covered with checkered steel plate, and the floor above the core ovens is of fire-proof construction. The cupola charges will be made up on the ground and weighed on the scale situated in front of the elevator, and then taken up to the charging platform. A complete track system will connect the foundry with the balance of the plant, and the greater part of the transportation of heavy material will be done by electric cars.

An English View of American Foundries.

During the latter part of 1902, this country was visited by what was known as the Mosely Industrial Commission, a body of British



SECTIONAL VIEW SHOWING SAND MIXING PLATFORM.

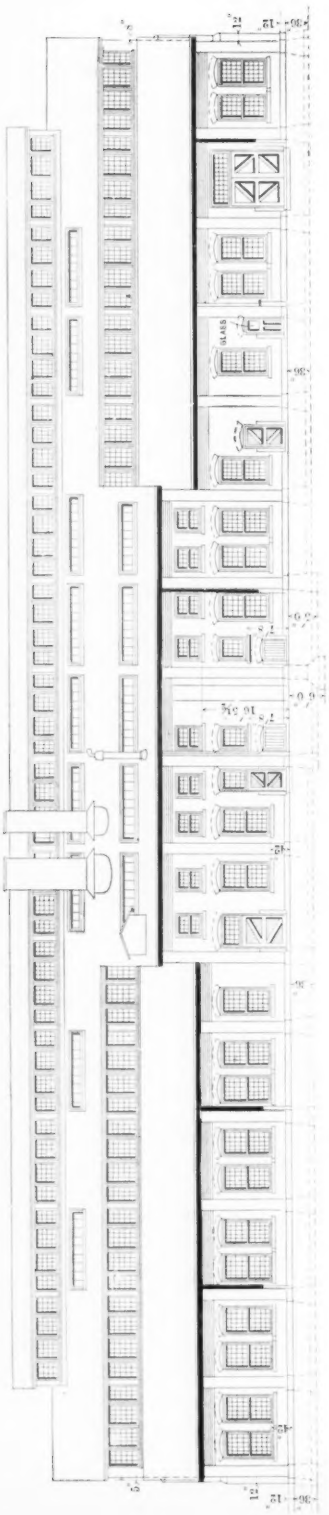


PLAN OF CORE OVEN, SHOWING FLUES AND FIRING POTS.

Trade Unionists, who came here for the purpose of becoming better acquainted with our methods of manufacturing and general social conditions. The foundry trade was represented by Mr. J. Maddison, of the Friendly Society of Iron Founders, of Great Britain and Ireland, who has recently made a report of his observations, and as we feel that the majority of our readers will like to learn the opinion formed of our shops by a fair-minded man from a country that has furnished us thousands of our best machinery molders and a great number of our foundry managers and foremen, we are going to reproduce such parts of same as are of general interest.

After referring to the new foundry of the Lackawanna Steel Co., at Buffalo, N. Y., where he found 80 journeymen working comfortably at the rate of $3.50 per day, without being rushed, a condition credited to the fact that the castings were being made for the company's consumption instead of the general market, Mr. Maddison says: "My real investigations may be said to commence with the Westinghouse Electric & Mfg. Co., at Cleveland, which has two large foundries side by side, one for light and the other for heavy work. It employs about 90 journeymen, and about 150 laborers; the latter I mention to show the difference in the number of laborers as compared with England. Only the foundries work on the nine-hour system, all other departments working longer hours. The wages are $3.00 to $3.50, and I should say the men work considerably harder than in England. Some very large castings are made, consequently the heavy shop was in a very disorderly state. The system of forming the molds with cores is largely adopted, resulting in very rough castings, and causing a considerable amount of dressing; quite a large number of core makers are employed in this shop, and are paid from $2.25 to $2.50 per day. Most of the laborers are foreigners, who can neither speak nor understand a word of English, the result being any number of mistakes in taking instructions as to what they are to do, which cannot be conducive to cheap management.

"We next visited the American Shipbuilding Co., engaged in very light marine work, and employing 36 molders. Here, too, the men appear to be kept on the move, and work 10 hours per day, time and half for all overtime, and double time for Sundays and all recognized holidays. The wages range from $2.90 to $3.50. In this class of work they



SOUTH ELEVATION OF THE FOUNDRY OF THE SHEFFIELD CAR CO., THREE RIVERS, MICH.

have something to learn from the English molder, especially in loam work, as when I described our method of casting loam work without ramming up, the foreman appeared very much interested in the system. In turn he took a great deal of trouble in describing a very neat little core machine, which I have no hesitation in stating that no foundry ought to be without. It makes 10 sizes of perfectly true round cores from ⅜ in. up to 1½ in. and 22 in. in length.

"The first foundry we visited in Chicago was that of Allis-Chalmers Co., a very enterprising firm, having quite a number of foundries in different towns. The shop in question was the best we had seen up to that time, being well lighted, of a good height, and good cranes. It was also provided with apparatus for cooling the shop in summer, and heating in winter; fancy any English firm being asked to make such provision for the comfort of its employes! Although the foreman was suffering from a burnt foot he received me very courteously, and was only too pleased to accompany me and give all the information at his command. The class of work was mining and engineering, some castings over 30-tons weight being made in dry sand. One hundred and twenty-three journeymen were employed, and wages were $3.00 to $4.00 a day, and the hours 55 per week. The firm intends to make the hours 54 per week after the New Year. I should say the men do not work any harder than in England. The cupolas are capable of melting 20 tons per hour. The molders had been on a strike in this shop for a considerable time on the hours question, and the dispute was brought to a close quite recently, the men gaining the point of contention. During the strike the usual free labor men, what the Americans term "scabs," came on the scene; in point of ability they seemed to be on a par with those sailing under the same flag in this country, as may be gathered from the foreman's statement, that he hoped never to pass through a similar ordeal. Indeed, he said he would not undergo such another experience for any money, it being no uncommon thing to run down 40 tons of iron per day and obtain 15 tons of castings, whereas with the union men the present percentage of bad work is only two per cent. Asked what had become of the scabs, he said they had gone to another shop belonging to the same firm in the town run with non-society men.

"We next made application for admission to Crane's shop but were denied; owing to the manager or employer having visited England some time ago, and being refused admission into one or more English firms, he had determined to reciprocate the treatment whenever opportunity offered itself. I was very much disappointed, as I had a great desire to see through this firm's works, their class of work being pipes. I understand they employ a good number of females under rather unusual circumstances.

"At Milwaukee we were readily admitted into another shop belonging to the firm of Allis-Chalmers, engaged in pretty much the same class of work as that of Chicago, viz., engineering and mining machinery. They make very creditable castings up to 60 tons' weight, and employ 126 journeymen; the wages are from $2.85 to $3.90 per day, and the men work a little harder than in England. They have a system of metal cribbing, hinged into each other, so as to have as little ramming as possible in connection with the loam molds. This firm have quite recently built a new foundry and engineering shops some five or six miles out of Milwaukee, which, with their usual courtesy, they allowed us to inspect, known as the West Allis Works, which is said to be the most up-to-date plant in America. The foundry is 560 feet long, and consists of three bays the center bay being 100 feet wide, the two side ones 60 feet each, making a total of 220 feet wide, with an area of 125,000 square feet. The crane facilities are excellent, one 60-ton traveling crane in the center bay, with a 15-ton auxiliary hoist, also two 40-ton with 10-ton auxiliary hoists. One of the side bays has three cranes, one of 30, and two of 20 tons, all with auxiliary hoists for light work. The other bay has two 20-ton and the usual auxiliaries for light work; all are overhead and driven by electricity. This shop is unusually well lighted and ventilated. A number of ventilating turrets are located in the roof, and provided with exhaust fans, driven by electricity, for removing the gas and smoke when necessary. It is also intended to heat the building by the hot water system in cold weather; such consideration for the comfort of their workmen never enters the minds of British employers. The drying ovens are fitted with doors on the roller system, like shop shutters, but the foreman does not approve of them as the heat escapes through the joints. Several large concrete pits are built in the floor for casting purposes. The iron and coke are loaded on an iron trolley, run up an incline by electricity, and tipped right into the cupola without ever being touched by hand. The flask-parts and other appliances are very creditable to the foreman in charge, who is an Englishman hailing from Derby. I may here mention that there appears to be an abundance of good molding sand all over the country. The wages in this shop are from $2.90 to $3.90 per day, and the men appear to work pretty comfortably. The works have not got their full complement of men yet; they expect to employ 200 journeymen when in full swing, and also contemplate an extension of 200 feet. I think the hours are 9½ per day, although I am not quite sure. The combined output of this firm in their Chicago and Milwaukee works is expected to reach 5,000 tons per month.

"I previously mentioned that the Allis-Chalmers Co. were running a shop in Chicago with non-union men. We quite accidentally dropped into this shop. The class of work was of a much rougher character than that of the other three shops already referred to. This shop is one of the oldest in Chicago, and entirely out-of-date, worked with jib cranes. I was shown drawings for a new shop they contemplate building on the same ground. On asking if the non-union element gave as good results as the union men, I was told, emphatically, no; they were employed because it was a question of the management refusing to submit to the union. Several colored molders were employed, but the foreman said that he never found any competent mechanics among them, as they appeared to have no ideas of their own. The time wages are $3.00 per day, but the majority of the men are on piecework.

"At Cincinnati, we visited the Buckeye Foundry, which is a very neat little shop, employing 45 journeymen. The class of work is machine tools, the castings being very creditable to both the men and the firm. The wages are from $3.00 upwards, and the hours 10 per day. The shop is kept very orderly and is well equipped with tackle, thus enabling the men to do a good day's work without hustling. This firm deals very fairly with the men; for instance, if a man is making four of a certain job for a day's work, and he makes five, he is paid time and a quarter, or the full pay for the fifth one, no attempt being made to stop any part of his extra effort. This is as it

should be. A little plate work is done in this shop, but not to any great extent, and, of course, piecework. The molders of Cincinnati enjoy a privilege which is not allowed elsewhere; if a man is working at a job which takes more than one day to make, each day that he does not cast is considered as a cold day, and he is allowed to leave off work 1½ hours before the regulation time, and paid the full number of hours. I have hitherto omitted to state that most of the foundries visited have a chemical department for analytical purposes, which might be profitably adopted in Great Britain.

"At the plant of the United States Cast Iron Pipe & Foundry Co., located at Addyston, Ohio, we found a very fine jobbing pipe shop, equipped with good crane power and splendid tackle to work with. Pipe 6 and 7 feet in diameter are very common sizes and I was informed that they make these up to 12 feet. This concern seems to be well up in the pipe making industry. A large drying oven is built in the floor, 40 feet by 25 feet and 18 feet deep. This is fired from one corner at the bottom, a fan being provided for drawing the cold air out of the bottom of the oven. It is very seldom that the molds require more than one night to dry. The wages paid in this department to molders are from $3.00 to $3.75 per day for 10 hours, and the men seem to work fairly comfortably. The pipe shop proper is built on a very elaborate scale, but, as is well known to one acquainted with such works, it is a very undesirable place to work in. The men who act in the capacity of overseers or foremen receive $2.50 per day, the balance $1 50, with the exception of the colored laborers, who are paid 25 cents a day less. The reason given for this is that the latter would not work steadily if they were paid as much money as the former, but would, instead, lay off and indulge in drinking. I was surprised to find the old-fashioned core bars in use with hay bands, not a single collapsible bar being seen about the place, but by the aid of a pressed roller on the hay band it was wonderful how smooth and regular the inside of the pipes was turned out. One cupola in this department melts as much as 230 tons of iron per day.

"At the Niles Tool Works, Hamilton, O., which is far famed for its machine tools, sixty-four journeymen are employed in the foundry, which is a mixed shop, i. e., union and non-union men, and the wages are $2.80 and upwards. In shops previously visited I had seen no bedding work in the floor, a complete flask being generally used, but in this shop a good deal of bedding in is done. The foreman stated he had great difficulty in getting men to work on the other system. The method of forming molds with cores is largely in vogue, consequently a large number of core makers are required, who receive from $1.50 to $2.50 for a 10-hour day. Asked why there was not the slightest approach to an old man in the place, the foreman "guessed" that when they were unable to do the usual day's work there was not much demand for them. I consider this the hardest working shop so far visited.

"Our investigation at Pittsburg began with the plant of the Westinghouse Machine Co., at East Pittsburg, where over one hundred journeymen are employed. The class of work is machinery, castings up to 40 tons being made, and on the whole the work is very creditable to all concerned. There are two head foremen, one for each half of the shop, and each has two assistants under him. Hinged flasks are largely used, principally for the convenience of getting at the mold to finish it, and these flasks are very nicely gotten up. Wages vary from $3.25 to $3.50 per day of 9 hours, or 54 hours per week. Here they have the bonus system in force, but it is not carried out as is being attempted in England. For instance, I was shown a job by the young man who made it (an Englishman); although allowed 8 days for making it he completed it in five, but not the slightest attempt was made on the part of the firm to participate in the saving of three days made by extra effort, the man being paid the full eight days' wages. When a bad casting occurred he was paid for the five days actually spent in making it and then paid the full eight days for making it over again, thus simply losing the three days of extra effort. This statement I had confirmed by the foreman. This same young man had £14 to draw for 13 days' work under this system. I have omitted to state heretofore that in almost every shop the pein rammer and flat rammer are combined in one tool, the flat rammer being only 2½ inches in diameter. Opinions will probably differ as to whether this is an advantage or otherwise.

"At the plant of the Mesta Machine Co., Homestead, Pa., general engineering is included along with the manufacture of machinery, and heavy castings are made in both iron and

steel. The shop is the longest ever seen by the writer, being 960 feet long by 60 feet wide. There are also provided small portable jib cranes which can be transferred by the over-head cranes and attached to any column along the shop. Foremen and men agree that shops of this length are not advantageous, as the cranes are apt to block each other. The wages and hours are the same as in the Westinghouse shop; the coremakers are better paid than I have generally found, and get $3.00 per day. I consider the pace very little harder than in this country.

"We next called at the plant of Mackintosh, Hemphill & Co., known as the Fort Pitt Foundry, said to be the oldest foundry in the town. The class of work done may be termed general engineering, including steel. Although an old shop, it has two good 20-ton cranes, which have had their lifting capacity severely tested, as some time ago a bed-plate was made in this shop, 74 tons weight, and was lifted by these two cranes. This casting was made in dry sand, and I understand was faultless. I noticed that the steel castings had a much cleaner skin than is generally found on such castings. The wages and other conditions were similar to the two previous shops.

"The Pennsylvania Railroad shops, at Altoona, Pa., are very extensive and employ about 7,000 hands, who speak very highly of the company as employers. In the foundry department piecework seems to be the order of the day, and there is a good deal of machine work. General molders are paid $2.50 per day, and when on piece earn $3.50 to $4.00; coremakers are paid $2.50 to $3.00; machine molders on piece earn $3.50 per day; brass molders earn $3.50 to $4.00, on piece; the chilled carwheel makers earn $3.50 to $4.00 per day; they are simply handy laborers, each having a helper, who, in turn becomes the so-called molder. Some time ago, the foreman brass molder was sent to England by this firm, to see if he could learn any points, and he declares that the Lancashire and Yorkshire railway shops, at Horwich, are the most complete he ever saw; even the U. S. A. must take a back seat with such a firm. In the Altoona works, specialization and subdivision are the general features throughout. Altoona is considered to be a thorough workingman's town; it is said that 90 per cent of the workingmen own their own houses, which, if true, will be hard to beat in any town.

"There being very little industry in Washington, our stay there was largely given over to sightseeing. We did, however, accidentally fall across a small foundry on a primitive scale, where only five or six men are employed, the wages being $2.50 to $2.75 per 9-hour day. Washington is on the border of the Southern States, and wages gradually get lower as you go south; owing to the excessive heat, the colored race are largely employed and the class of work not of a very high order. We visited the Navy Yard, where the engineering shops seemed very good and on a large scale; but I was very much disappointed with the foundry—indeed, I consider it a disgrace to the nation.

"At Philadelphia we commenced our investigations in the far-famed Baldwin locomotive shops. Here we found most of the work done on a piecework system of the blackest dye, viz., jobs taken by contract by one man and sub-let to men under him—the sweating system pure and simple, consequently the pace is very fierce and the work scandalously finished. The time wages are $2.90, and the hours 60 per week. I noticed that the roof of the foundry was level and without sky-lights, and on inquiry ascertained that the boiler shop was on the top of the foundry, and was told that a smith's shop was on the top of the boiler shop. I should say the success of this firm is attributable to cheap labor and rough work.

"Leaving the Baldwin works, we stepped into that of Sellers & Co., tool makers, close by. This firm willingly escorted us through their fitting shops, but declined to allow me into their foundry, into which I was simply allowed to peep. We next visited Bement, Miles & Co., tool makers, in close proximity to the two last-named firms. Here 42 journeymen are employed, all piecework, and, of course, the pace is naturally hot, but they get very good money—indeed, were I to name the amount it would be discredited. All the firms in Philadelphia, except Baldwin's, work 56½ hours per week. I may say there is an abundance of excellent molding sand in the immediate locality. It is said that 30 per cent of the workingmen of Philadelphia own their own houses.

"Our first visit in the vicinity of New York was to the plant of E. W. Bliss & Co., Brooklyn, where 75 journeymen are employed, at $3.00 to $3.75 per day of 9 hours; the class of work is general jobbing, including some light marine work. Here I found a Tabor

molding machine, worked by a molder, receiving the same rate of wages as other men in the same shop, not working piecework, and the firm was perfectly satisfied with the result. My reason for making special reference to this is because English employers refuse to allow molders to work the Tabor machine. This shop is well craned, fairly well lighted, and the pace a little faster than ours. We next went to the Lidgerwood Mfg. Co., where 50 molders are employed, and the wages and hours the same as in the previous shop, the class of work being hoist and marine work. Here I found (to me) a new feature in core-making without "vents," and, up to certain sizes, without irons. They are made of sea-sand, mixed with linseed-oil, ratio 1 to 45; such cores can be blown to pieces when placed in the core oven, but when dry sound like a piece of pot. Unless the core has a level top, so that it can be turned on to a plate, there must be metal core-boxes, so that each core can be dried in the box; consequently, if more than one is required each day, then the number of core-boxes must equal the number of cores required each day. Another great advantage in connection with such cores is that next to no labor is required to take them out of the castings. Core-makers receive $2.25 to $2.50 per day. This firm are also running Tabor and Pridmore machines, each worked by molders, as in the previous shop, and giving satisfactory results, the pace much about the same.

"We next visited the Worthington Pumping Co., Elizabethport, N. J. This is a very extensive plant, employing 140 journeymen. Wages from $2.80 to $3.50, core-makers $2.50. Here we find another new feature in the shape of 30 young women making cores, all piecework, earning from $1.00 to $2.50 per day of 9 hours; most of the cores made by these girls are made similarly to those described in Lidgerwood's, viz., without vents and irons, but the mixture of linseed oil is given as 1 to 60. This firm bears a good name amongst its workmen. Two Englishmen working in the shop declare that they do not work any harder than in England. Sixty-four men are working various machines and plate work, all piecework; they are not molders. The shops are equipped with the usual good crane-power.

"We turn next to S. L. Moore & Sons Co., shipbuilders, in the same town; number of journeymen, 35; wages as above. One shop is engaged exclusively on loam work. They were busy ramming a loam job up with the pneumatic rammer when we were there, and the foremen asked if we had anything like that in England. I replied that we did not require such rammers, as we had a system of casting loam molds without any ramming whatever, which I explained.

"We closed our labors in Elizabethport by a visit to A. & F. Brown, pulley manufacturers, where 30 men are employed, and the wages and hours the same as in the two previous shops. Several pulleys are made on the machine, although the foreman protests against the Pridmore being considered a molding machine, and I agree with him, as the job is rammed up in every particular just as if there was no machinery about it; it is simply drawing the pattern down through the plate, a principle which every molder is cognizant of.

"The J. L. Mott Iron Works have quite a number of small shops, employing 155 journeymen on a very light class of work, such as bathtubs, stoves, and hollow-ware work generally, mostly piecework. Our next and last stop was the Jackson Architectural Iron Works. The work, as the name of the firm indicates, is general castings for structural buildings, for which there is a great demand in and around New York. The foundry is somewhat antiquated, with the jib-cranes stuck in the center of the shop.

"I may here mention that in almost every foundry visited I have found the wooden flask in use, more or less, and generally with advantage, as it does away with a good deal of crane work, the hand lift being much quicker. For small bench work requiring boxes from 14 inches square up to 14x30 inches, but one box is used, and after closing the box, it is opened by a clasp on one corner leaving the mold boxless, so that only one box is required for any number of molds; which are weighted down by a plate about 1½ in. thick, with provision made for pouring the metal in.

"I have also omitted to state that the molders wear a suit of overalls whilst at work, and are generally provided with a locker each, for their other clothing; they wash and change before leaving the works."

Summing up the results of his observations, Mr. Maddison says in his closing remarks: "My investigations were as carefully conducted as the time at my disposal would allow. I have come to the conclusion that the American molder turns out something like 25 per

cent more work than the English molder ; 10 per cent may be said to be due to extra effort, and the other 15 per cent to better facilities. I may here cite a case as an illustration of better facilities. Some seven months ago I was invited by an English employer to visit his works on his complaint that he could not get a fair day's work from our members in his employ. The particular job in question was made in sand, and I found that the man really had no tools to work with, being without shovel, rammer, dry brush, sieve, etc. Now, anyone must know that whilst a man is looking about the shop for such tools he cannot be molding at the same time, therefore the want of proper tools to work with is a dead loss to the employer. Now, the American employer not only sees to the molder having a shovel, but he generally sees that he has someone to use it in the shape of a helper (laborer), and those engaged on medium and heavy work seldom handle the shovel at all, which results in more molding being done. I am quite aware that the fact of my not having worked at the trade for over 16 years may cause some doubt as to my capability to judge the pace of the two countries, but let me state that I have not depended solely on my own judgment, as whenever I came across English molders I have consulted them on this point, and there is a pretty general agreement that they do work a little harder to an extent which I have put at 10 per cent.

"I now come to the important question of wages, which, I conclude, will work out at $3.25 per day, equal to £4 1s. 3d. per week. We must not overlook the fact that our investigations were confined to large centers of industry, therefore comparisons should be made with our own large centers, such as London, Liverpool, Manchester, Sheffield, and Leeds, where, with the exception of Leeds, the wages are £2 per week ; thus it will be seen that the American's wages are more than double those of the English molder.

"It must not be inferred that the British workman is in any way inferior to the American ; on the contrary, wherever we found English molders they were invariably amongst the best work, and it may be taken for granted that in America, as elsewhere, men are positioned in accordance with their ability. Indeed, specialization is carried out to such an extent that they are not making all-round molders, and consequently are depending on other countries to supply their requirements in that direction. The English employer often whines over the restriction of apprentices to one for four journeymen, but in the States, they only allow one to eight journeymen. The British employer has more to learn from America than the British workmen."

Personal.

Paul R. Ramp, lately general foreman of the foundries of the American Locomotive Co., at Schenectady, N. Y., has accepted a position as assistant general superintendent of the foundries of the American Brake Shoe & Foundry Co., with headquarters at Mahwah, N. J. He is succeeded at Schenectady by Robert McFarlane.

T. M. Light has been selected as foreman of the Frontier Iron Works, Buffalo, N. Y.

S. F. Day has been appointed foreman of the foundry of the W. J. Loth Stove Co., of Waynesboro, Va.

Harry Palmer has assumed the foremanship of the foundry connected with the East Buffalo Iron Works, East Buffalo, N. Y.

John Trueman has been placed in charge of the foundry operated by the Dobbie Foundry & Machine Co. at Niagara Falls, N. Y.

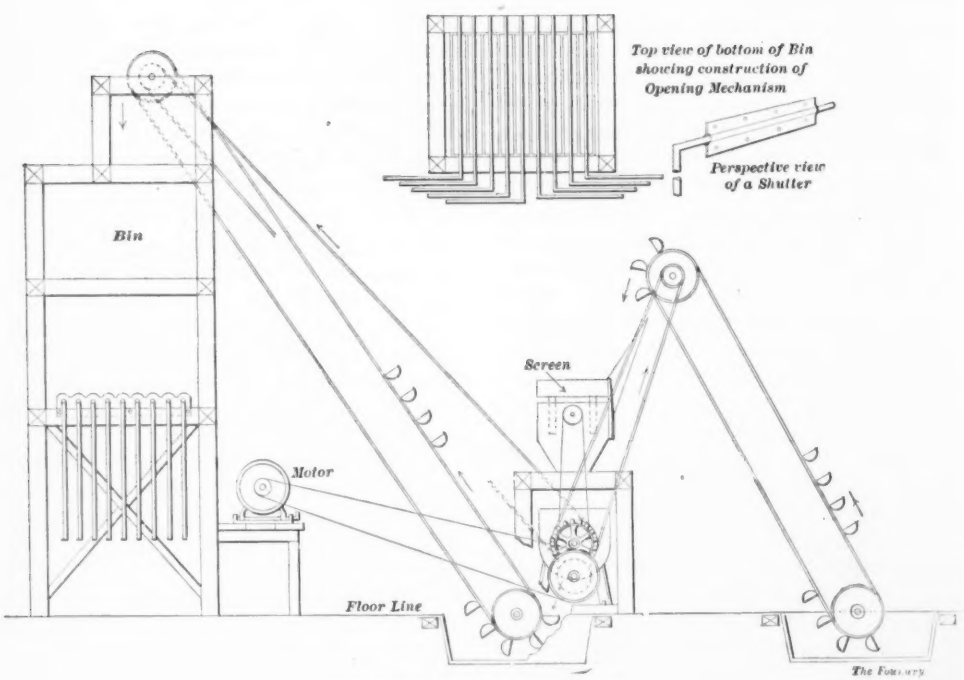
John Arrowsmith has been appointed foreman of the Chas. Creighton Foundry Co.'s plant at New York City.

L. A. Roe, lately foreman with the Richmond Co., of Norwich, Conn., has taken charge of the shop of the Thatcher Furnace Co., Newark, N. J.

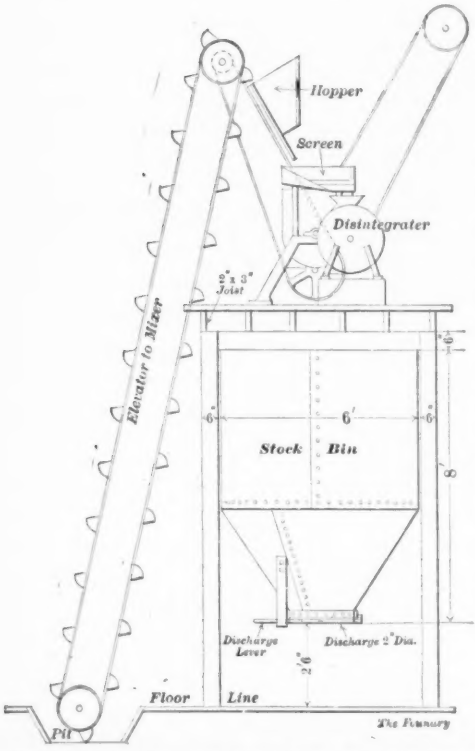
White Metal for Patterns.

A white metal pattern must be hard enough to withstand more or less rough usage. An alloy of 80 parts of tin and 20 parts of antimony answers well, but many object to the expense of the tin. If a cheaper mixture is desired, an alloy of 80 parts of lead, 10 parts of antimony and 10 parts of tin may be used. If these alloys, however, are not tough enough the amount of antimony may be decreased. Patterns made from them may be readily soldered with soft solder (half and half). The alloys will also melt in an iron ladle, a necessary feature in pattern making.—*The Metal Industry.*

The plant of the Lorain Foundry Co., Lorain, O., has been taken over by the Lorain Steel Co.



COMPLETE SAND-MIXING PLANT.



ANOTHER INSTALLATION, COMPLETE WITH ELEVATOR, MIXER, DISINTEGRATOR AND STOCK BIN.

Equipment for Mixing and Handling Core and Facing Sand.

The Standard Sand & Foundry Supply Co., of Cleveland, Ohio, are making a specialty of supplying equipment for handling and preparing sand for either cores or molds, claiming that where from 90 to 95 per cent of sand is being mixed with from 5 to 10 per cent of other material, this can not be properly done by the use of simply a screen and a shovel.

In order to secure greater uniformity, the Standard Sand & Foundry Supply Co. provide their machines with a watertank and graduating glass to measure the water sprayed on the sand. Where oil is used for core sand a separate tank and spray pipe are supplied. All of the mixing parts of the machine are made of hard steel and malleable iron; the machine is also fitted up with an adjustable steel cleaning scraper that keeps the sand from sticking to the shell of the machine and prevents all wear on the mixing paddles.

We append a couple of sectional illustrations showing complete sand mixing plants recently installed by the Standard Sand & Foundry Supply Co.

Deaths.

Edmund Parsons Dwight, president of the Chester Steel Casting Co., of Chester, Pa., died May 24. Mr. Dwight was of New England origin, a direct descendant of John Dwight, who settled in Dedham, Mass., in 1634, and son of Jonathan Dwight, of Belchertown, Mass. He was born on November 23, 1815.

William Russell Warner died at his home in Covington, Ky., Tuesday, May 12. The 12th of June would have been his 48th birthday. He was born in Covington and was brought up there except for a residence of a few years while a boy at Ashland, Ky.

W. R. WARNER.

He has always been identified with the iron business, as he started as a boy in the old commission house of William Means in Cincinnati. Going to the Shelby Iron Co., Shelby, Ala., he was for ten years the assistant superintendent under the late Jefferson Christian, who was rated the most expert maker of charcoal iron in the country. Later he was the superintendent of the Alice furnaces of the Tennessee company in Birmingham. From Alabama he returned to the north, spending a short time in the Hocking Valley field as furnace manager. From there he came to Cincinnati, associating himself with the Dayton Coal & Iron Co., and afterwards with Rogers, Brown & Co. He left their service in 1893, and for the past ten years has been with Matthew Addy & Co. He was personally known to practically every foundryman throughout the middle west.

Lyman H. Goodnow, president of the L. H. Goodnow Foundry Co., of Fitchburg, Mass., died at his home in Fitchburg, May 23. He was 75 years old. He was born in Boylston, Mass., and began his manufacturing career in Worcester at the W. A. Wheeler foundry, where he was for a time a foreman. Afterward he was a foreman at the Washburn & Moen Works, and later engaged in business for himself as a pattern maker and a manufacturer of wire drawing machinery in Worcester. He went to Fitchburg in 1875 and engaged in the foundry business. In 1896 he incorporated his business, taking in his son, Arthur L. Goodnow.

Among the Foundries.

The Black-Clawson Co., of Hamilton, Ohio, is having plans prepared for a modern plant which will include a new foundry.

The Manitoba Iron Works, Winnipeg, Manitoba, is building a foundry, machine shop and other necessary departments of a manufacturing establishment, which will be placed in operation at an early date.

The Southern Foundry & Machine Works, of Fredericksburg, Va., has changed ownership and will be enlarged.

The Scheidler Machine Works Co., of Newark, O., has been incorporated with a capital of $60,000 and succeeds to the business carried on by the late Rheinhardt Scheidler.

The Eureka Foundry Co., of Rochester, N. Y., will erect a new plant, the main building of which is to be 75x120 feet.

The Walworth Mfg. Co. are building a new brass and iron foundry at its plant at South Boston, Mass. The building will be 80x300 feet. The present foundry will be retained for light work and the new one will be given over to heavy castings.

The American Folding Machine Co., recently organized with George C. Vaughn, formerly of the Vaughn Machine Company, of Peabody, Mass., as the head, will erect a plant at Peabody for the manufacture of collar and cuff machinery. It will consist of a machine shop 60x163 feet and a foundry 65x125 feet.

The Melius-Steele Machine Works, Gloversville, N. Y., has purchased the foundry of Bayard McGuire, and will operate it in connection with its machine business, which has been moved into the newly acquired building. A number of improvements will be made and the capacity increased considerably. The company make a specialty of leather machinery of every description.

A brass foundry is to be established at Leetonia, O., by Messrs. Cooper & Barber, who will refit a building to contain two furnaces. A full line of brass, aluminum and bronze castings will be made.

The Buffalo Forge Co., Buffalo, N. Y., has purchased the plant of the Buffalo Steam Pump Co., at North Tonawanda, N. Y., which will be continued in operation as heretofore.

The foundry and machine shop formerly operated by M. Darragh & Co., at West Bridgewater, Pa., which was recently purchased by John W. Grove, of Grove & Knox, Pittsburgh, will be operated by a new company to be known as the Grove Foundry & Machine Co.

The Gruson Iron Works, of Eddystone, Pa., has changed its name to the Eddystone Foundry & Machine Co.

The Detroit (Mich.) Register Co., manufacturer of registers, ventilators, sad irons and iron novelties, will go to Milan, Mich., where it is building a plant.

The F. C. Patton Co., of Sycamore, Ill., has begun work on a new foundry building to be 70x200 feet.

The George A. Hogg Iron & Steel Foundry Co., of Pittsburg, Pa., is arranging to build a new plant at Rosslyn, a suburb, where both iron and steel castings will be manufactured. The plans call for a foundry 300x450 feet.

The Racine Steel & Iron Mfg. Co., Racine, Wis., manufacturer of cast and steel wagon skeins, jack screws, etc., has increased its melting capacity to over 80 tons per day. It is expected shortly to complete plans, which will make the plant sufficiently large to handle 80 per cent. of the skein business of the United States.

The Pennsylvania Malleable Co., McKee's Rocks, Pa., is building an addition to its foundry, 60x180 feet, and also a coreroom, 40x120 feet. When these additions are completed the company will increase its output from 60 to 85 tons daily, and will employ about 50 more molders.

The Schill Bros. Co., Crestline, O., stove manufacturers, is erecting a foundry building 125x390 feet.

The Merrell Mfg. Co., Toledo, O., is building a new foundry department, it being the intention to utilize the present quarters as an erecting room.

The Perkins Machine Co., of Boston, Mass., whose foundry was destroyed by fire a short time ago has secured a new site upon which it is the intention to erect a main building 130x600 feet to be used as a foundry and machine shop.

The Vulcan Iron Works, of Winnipeg, Manitoba, has had plans prepared for a new foundry building to be 100x200 feet.

Mockly Bros. & Sailer, of Menasha, Wis., have purchased the property they have hitherto occupied under lease and will make substantial improvements and enlargements.

It is announced that Morris & Lewis will build a foundry at Rock Island, Ill., and return to that place in about a year when the lease upon their Chicago plant expires.

The Wheland Machine Works, of Chattanooga, Tenn., propose to erect a foundry addition to their present quarters.

The Aetna Foundry & Machine Co., of Springfield, Ill., will increase the size of its molding space to 90x110 feet. This is one of the oldest foundries in the state, having been established by James Lamb in 1847.

The Union Brass Foundry Co., has been incorporated at Lowell, Mass., by Patrick H. and John Ryan with a capital stock of $10,000.

T. Abbott & Son, of Terrell, Texas, are building a foundry 65x100 feet.

The John W. Lewis foundry, at Murphysboro, Ill., has been purchased by H. H. Jenkins, who will increase its capacity.

The Acme Foundry Co. has been incorporated at Detroit, Mich., with a capital of $10,000.

The Western Foundry Co., of Covington, Ky., will extend its present works to take care of increased trade.

The Downie-Wright Mfg. Co. has been incorporated at York, Neb., with a capital stock of $75,000.

The Crown Iron Works Co., Minneapolis, Minn., is building a new foundry.

The Canadian Iron & Foundry Co., of Hamilton, Ont., intends to erect a new foundry for heavy castings, continuing the present quarters as a car wheel department, besides

turning out the smaller class of castings at this point. The new foundry will be about 150x250 feet.

The Baldt Steel Casting Co. has acquired a site at New Castle, Del., adjoining that of the Brylgon Steel Casting Co. The company will erect buildings at the expenditure of $250,000. Frederick Baldt, who has been prominent in the steel casting business at Chester, Pa., for many years, is president of the Baldt Co.

The City Foundry Co., Lorain, O., succeeds to the business of C. H. Gove & Co., and is composed of John Schwartz, George Roth and John Hyer.

The Brown Corliss Engine Co., of Corliss, Wis., will extend its foundry, nearly doubling its present capacity.

The Loomis-Pettibone Gas Machinery Co., of 52 and 54 William St., New York, will erect a very extensive manufacturing plant at South Elizabeth, N. J. The plant will consist of six extensive buildings of brick and steel, the largest of which will be the producer shop, 100x680 feet. Parallel to this building will be the machine shop proper, consisting of two buildings joined together, one 65x600 feet, and 40 feet high; the other 65x600 feet, and 17 feet high. The foundry, 112x500 feet, will be connected with the machine shops by a covered storage space, 175 feet, in which will be installed a 65-foot Gantry crane of 40 tons capacity. The erecting shop will be 40x150 feet, and the pattern and storage house 112x200 feet. A 1,200-horsepower producer plant will be installed for testing engines and for furnishing gas to run the 500-horsepower engine in the power plant. Gas from this plant will also be used for the core ovens, drying molds, forges and for heating purposes. The plant will be operated throughout by electricity. The company will manufacture gas engines in large units, in addition to the Loomis-Pettibone gas apparatus, which they will continue to manufacture as heretofore. Cyrus Robinson, vice-president and general manager, is the engineer in charge.

A. Johnson has purchased the foundry at Salina, Kansas, formerly operated by J. F. Neff.

It is reported that the American Radiator Co. will establish a plant at Litchfield, Ill., to be completed by October 1st.

The John B. Morris Foundry Co., of Cincinnati, O., will erect an addition to its plant 90x91 feet, to cost $5,000.

The Washington Stove Works has been incorporated at Everett, Wash., by Wm. Mackey, I. M. Smith and E. Mackey with a capital stock of $50,000.

The American Foundry & Machine Co. has been incorporated at Atlanta, Ga., by W. H. Bayne and J. L. Watson.

Peter Hanson has established a foundry and machine shop at Madison, S. D.

Pardee Bros. & Co., of Lattimer Mines, Pa., will build a foundry and machine shop during the summer, where all repair work for their collieries will be made.

The William Adams Foundry Co., Philadelphia, Pa., has been incorporated with a capital stock of $150,000 by William Adams, J. K. Bougher, W. H. Hunt and E. T. Dinlay.

The Rider-Ericson Engine Co. is having plans prepared for a modern foundry to be erected at Walden, N. Y.

F. C. Bracer has purchased the J. A. Frenzel foundry at Wausau, Wis., which he will improve and enlarge.

Otto E. Haubold has purchased the Parsons Foundry & Machine Works at Parsons, Kansas.

The Illinois Machine & Foundry Co., of Chicago, has increased its capital stock from $50,000 to $125,000.

The Gould Mfg. Co., Smiths Falls, Ont., is extending its foundry to take care of its rapidly increasing stove trade.

The University of Utah, Salt Lake City, Utah, is extending its foundry department.

Thomas Flanagan has purchased L. W. King's foundry at Fairbury, Ill.

The Rincon Foundry Co. has been incorporated at San Francisco, Cal., with a capital of $50,000.

A. R. & J. W. Robinson will locate a foundry and machine shop at Talladega, Ala.

Harry Robbins intends to establish a foundry at Medina, N. Y., during the present summer.

Some Inventions Relating to the Casting of Rolls.

Those who have enjoyed the privilege of visiting steel works and a chance to observe the rolling of different shapes must have been impressed with the strain put upon that class of castings known as rolls. One who sees the passing and repassing of an ingot through the rolls until it appears as a finished rail or in the form of other products can not help but wonder that the solid mass of cast iron known as a roll withstands day after day the severe service to which it is put. True a roll breaks

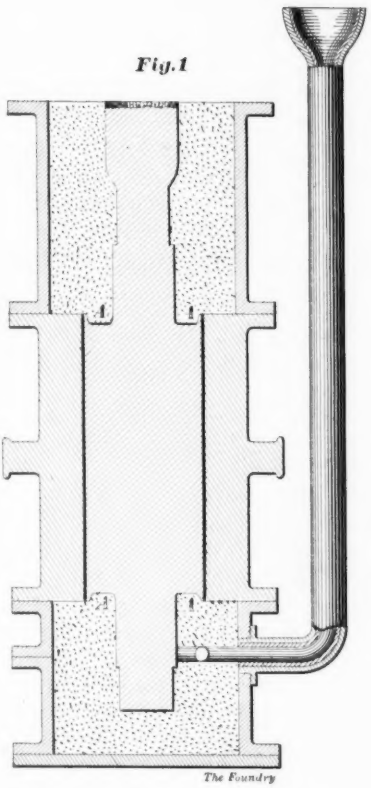
occasionally and furnishes a job for the foundry in burning on a new neck, an operation which has been illustrated on several occasions in this journal.

There is another defect, which at times appears as an epidemic in this class of castings, known as chill cracking, wherein the body of the roll itself gives away under internal stresses. Occasionally a roll will crack without exhibiting any apparent cause, in fact rolls cast from the same metal, the same heat in fact, will not always give the same wear. Of course changes may be made in the mixture of iron from which the rolls are cast which will tend to weaken the roll, although it is generally conceded that the real reason of the chill cracking of rolls has its origin outside of the mixture employed and is to be found in the conditions under which the roll is cast and cooled. It is also agreed that the roll may be used in such a way at the mills as will materially shorten its life.

When the roll is cast within a chill the depth to which its surface will be chilled will depend upon the mixture of iron employed, the thickness of the chill in which it is cast, within certain degrees, and the length of time its surface remains in contact with the chill. It is a common experience to find that a roll is chilled to a greater depth on one side than the other and this unequal chilling is in itself believed to be responsible for many of the breakages which occur after the roll is put into use. A foundry may be ever so careful about its mixtures and designs of chills and yet experience a streak of defective rolls through uneven chilling.

The Lewis Foundry & Machine Co., of Pittsburg, have paid a great deal of attention to the question of obtaining rolls having a uniform chill and it is several years since we illustrated one of their methods of manufacture having this for its object. Their late foundry foreman, Mr. Frank Gorman, has been granted during the past few years further patents covering methods for securing a uniform chill in rolls and to these this article will be devoted. It is recognized that before a uniform depth of chill can be produced upon the surface of the roll and its true cylindrical form maintained, the roll must be held centrally within the chill in which it is cast during its cooling and solidification, so that all points will be held equidistant from the face of the chill. It may be argued that if the mold for a roll occupies a vertical position when it is being cast that the chilled portion should be even in thickness throughout that part of the casting which comes in contact with the chill. The fact remains, however, that a casting made in a cylindrical chill will in most cases cleave to one side or the other with tenacity instead of locating itself in the center of the chill and thereby guaranteeing a casting of uniform chill.

Fig. 1



It being conceded that all surfaces of a chilled casting must remain in contact with the chill mold an equal length of time before uniform chill can be secured Mr. Gorman accomplishes this by casting a relatively thin circumferential ring or projection at each end of the roll as shown at A, Fig. 1. He says that he has found that where such thinner ring shaped end portion is formed integrally with the roll it will cool much more quickly than the body of the roll on account of its relative thinness and while doing so will retain its cylindrical form and will thus serve as a guide for the roll during its solidification and cooling and hold the same centrally within the chill mold, sliding downwardly over its inner surface as the roll shortens in cooling. When the casting is removed from the mold, these rings are cut away during the turning operation, and by

their removal the roll-body is reduced to the length desired.

It is apparent that this method involves no changes in equipment as the only alterations are made in the sand portions of the mold, which, instead of offering a flat surface at the ends of the roll, have the projections shown in the illustration, the mission of which has already been explained.

Another invention of Mr. Gorman, having for its object to lengthen the life of chills used

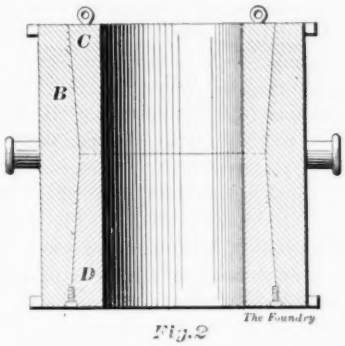


Fig. 2

in casting rolls, is shown in Fig. 2. As ordinarily made these chills are cast in one piece and it is considered excellent practice if each will stand the casting of thirty-five rolls after which they must be discarded, as they have become so warped and fire-cracked as to be of no further use. To avoid a percentage of this loss Mr. Gorman proposes to provide the chill B with liners C and D, the latter being renewable as soon as burned out without affecting the part B.

It is well known that in making chilled rolls the greatest pressure is at the bottom and that the base portion of the ordinary form of mold cracks first, thus rendering it necessary to discard the mold, although its upper portion may be in perfectly good condition. In the mold here illustrated the inclosing casing remains practically unaffected, and upon the cracking of the liner D a new part may be substituted therefor and the upper section C retained for use until it is worn out, when a new section may also be substituted therefor. A considerable saving is thereby effected, as the upper section lasts much longer than the lower section, and this construction obviates the necessity of discarding both when one becomes injured. It is also claimed that this method of constructing chills for roll molds is of advantage in making a perfectly-formed roll having a wearing surface harder than that obtained in the ordinary mold.

In the design of a mold for a chilled roll shown in Fig. 3, Mr. Gorman has devised a sectional, renewable, water-cooling chill for roll casting with the object of securing uniform cooling of the mold and thus avoid cracking and warping of same. This patent also covers molds for rolls having a corrugated, roughened or serrated inner surface in contradistinction to the smooth finish molds in common use.

In making chilled rolls it is well known that the chill in which this is cast is subjected to intense heat, bringing about the crystallization of the metal in the chill and causing oxidation which renders the mold unfit for further use and also causing flaws in the roll. This is due to unequal expansion and contraction and to the ordinary method of cooling, which renders uniform cooling practically a matter of impossibility. In order to avoid these objectionable features and provide for the uniform cooling of the casting as well as the mold Mr. Gorman leaves a space between the outer casing of the chill, E, and the liner, F, through which water may circulate and abstract the heat. The purpose of locating the inlet, G, at bottom and outlet, H, at top of the mold is to more quickly carry off the heat at the outset from the bottom, which is ordinarily the hottest part, and so thereby secure a more thorough and equal cooling of the mold and casting. It will be readily understood that as the water enters the base of the mold first a greater proportion

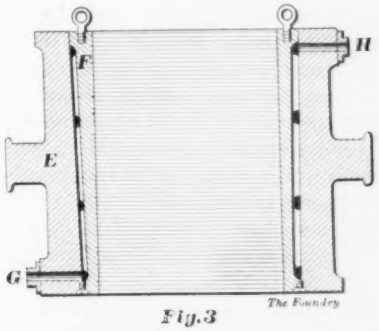


Fig. 3

of the heat will be abstracted at that point until the temperature of the mold and casting is substantially the same at all points, when a practically uniform cooling will ensue, whereby all liability of unequal contraction of the metal will be avoided.

In the ordinary process of casting a chill roll the mold is first heated to a temperature high enough to dry the portion made in sand which forms the neck and coupling of the roll and is then cooled to a lower temperature to

receive a coating of blacking to prevent the molten metal when poured in from adhering to the internal face of the mold. To apply the blacking to the smooth surface of the ordinary mold when it is hot is difficult, and it is practically impossible to secure an even and uniform coating on such a surface. Hence irregularities exist, which cause cracks in the surface of the roll, owing to the sticking of the metal to the mold.

Another objection to the common form of mold having a smooth or dressed inner surface is that cracking of a large proportion—sometimes as high as ten per cent—of the rolls occurs in casting, owing to the entire weight of the roll falling upon the chilled portion of the roll, which splits under the strain. When the metal is poured into the mold a rapid contraction of such metal and expansion of the mold takes place, by which the outer or chilled portion of the roll is drawn away from the wall of the mold, and as the roll is supported only at the base it will be clear that the chilled portion is subjected to great strain and that even when cracking is avoided flaws are liable to occur. These difficulties may be avoided by providing the inner surface of the chill with a roughened face to the depth of, say, from one-sixteenth to one-eighth of an inch, as occasion may require. This roughened surface not only permits of the internal wall of the mold being uniformly coated with the blacking, by which surface flaws in the roll are prevented, but the interstices thereof are filled by the molten metal as it flows in the mold, forming a corresponding roughened surface on the roll, and these two surfaces act in the nature of a separable bond to assist in supporting the roll until the expansion of the roll has been sufficient to withdraw its roughened surface from engagement with that of the mold. By this means the entire chilled surface of the roll is supported and braced until the central portion of the roll has to a great extent settled and its chilled surface has become hard enough to withstand the strain.

Blow-holes in Iron Castings.

This subject receives some attention in the *English Mechanic* by a correspondent who says that before any remedy can be suggested for the prevention of blow-holes, we must of necessity know what they are and what is their cause? All holes in castings, whether shrinkage or draw-holes, sand-holes, or blow-holes, are classed by the uninitiated, among whom are, strangely, probably nine-tenths of the molders, themselves, "blow-holes."

We will consider first porousness caused by the peculiar property which metal has of contracting, as it were upon itself in changing from the fluid to the solid state. Immediately upon pouring the metal into the mold the outside becomes solid, and to a great extent resists the inherent tendency of the metal to draw or shrink; and if the casting be of even thickness throughout, the result will be a general porousness or open grain, gradually but slightly increasing in porousness towards the center, a condition which is of no particular disadvantage.

If, however, the casting be "fed," the constant breaking into the center of the mass by the "feed" rod will allow the shrinkage to be "made up," and will result in the center metal being of equal (or greater sometimes) density to the outer. Should, however, the casting be disproportionately formed, heavy masses abutting light, draw-holes will be formed or greater porousness near the light parts; and these holes may be either in the interior of the casting, or just under the surface (in this case owing to the surface being strong or thick enough to resist the drawing action), or on the surface, in which case the holes will not be holes, but "sinks" or hollows.

These troubles may be due to the fact that the castings are incorrectly designed, having heavy masses in close connection with light, in such a manner that sub-surface draw-holes are formed. Remedy: Feed the heavy parts to give them a supply of metal to draw from; but, better still, thicken up the light parts even if unnecessary strength results, and, if possible, core out the heavy parts.

It is, in the machine shop, quite common for castings to come from the planing machine warped, and nine times out of ten the trouble is laid at the door of the planer. Didn't slack out his bolts enough before taking the finishing cut, when, as a matter of fact, the warping is due to the self-contained strains reacting upon the removal of some of the bonds.

With sand-holes, and being due to similar causes, may be classed dirt-holes, blacking-holes, etc.; and as to the origin of these very little may be said further than to adjure carefulness upon the part of the molder. Seeing, however, that it is not always possible to insure this, it might be as well to give some idea as to how the result may be counteracted.

If we can be assured that all the loose dirt will rise evenly to the top surface—a surface

which is to be machined—it is always possible to allow an extra 1-16 inch or so for cleaning up. Now, if the metal is in any degree thick, cooling will set in before it is possible for the dirt to rise to the top, and, depending to a great extent upon the degree of thickness, the dirt will rise to various heights, and some will perhaps rise to the surface, some to within ⅛ inch of the surface, and so on; and when machining the same will be uncovered, and no matter how much we machine away we shall always uncover dirt.

To avoid this as much as is possible with dull metal, vent well to reduce the pressure of the air on the mold, allowing the metal to rise more quickly, and increase the head or height of the runner basin. This will insure that the mold is filled with metal as fluid as possible under these particular circumstances. But don't use dull metal unless castings are of large body.

To prevent the sand from the runner and gates getting into the mold, damp them with a "swab," to cause the dirt to adhere, or in finishing blow a little water on these parts. In all cases possible cut a dirt riser, to prevent the top metal from running into the gates, or place a dry sand core across the basin in such a manner as to prevent the top metal flowing under; and, above all, keep the "basins" full. When the metal has a deep drop, bury a few springs in the sand upon which the metal drops to prevent it being washed away, or set a dry sand core in the sand below the runner.

Opinions differ as to the formation of blowholes proper; but our opinion is that in nearly all cases these are due to the presence of impurities in the metal itself, and experience certainly goes a long way to prove the correctness of our impressions. In view of this we found it necessary to employ an iron as clean as possible, and the very highest quality of coke. After many experiments, we found the following brands of iron and mixture to give the best results, both as regards clean castings and good face:—"Gartsherrie," No. 3, 2 cwt.; "Sheepbridge," No. 3, 17 cwt.; Hematite, 1 cwt.; Durham foundry coke for fuel. As a flux we found fluor-spar far superior to ordinary limestone, used in quantities of about 14 lb. per ton, with a little extra to clear the furnace when "blowing down." The particular mixture given above is pre-eminently suitable for small machine-tool work, and gives a fine bluish appearance to the skin. For this class of work we only used up our own scrap; but probably a few cwt. of clean machinery metal would do no harm.

The great disadvantage of using "scrap" lies in the impossibility of knowing the exact quality you are using. The metal should be blown down as quickly as possible under a good volume of air, at low pressure, and allowed to stand in the ladles to give the impurities time to rise to the surface. Then skim off before casting. It is well, too, to stir the metal up well, to help the impurities to rise. The ebullition of the metal when in the ladle, owing to the disintegration of the various foreign elements, will have been noticed.

Never pour until the metal is quite calm, or the same action will take place in the mold during cooling, and blow-holes will form near the surface by reason of the inability of the agitated gases to escape through the chilled surface. In ordinary medium-size work blowholes are seldom formed through the steam generated from the damp in the sand, and if the mold is well vented to permit the steam when formed to have ready outlet, skin-drying is very seldom necessary. But when molding thin pipes, pans, etc., the inability of the steam and gases to escape through poor sand may result in blow-holes being formed, particularly if the metal is poured so quickly as by its agitated entrance into the mold to envelop the "air," and then cool before the latter can free itself. The remedy for this is to have good sand. The sand from the Mode Wheel Quarries, Manchester, is as good as any for medium work, being fine enough to insure a good face, and yet very open. For bench work use Mansfield sand. This, of course, refers to the facing sand only. For medium work, mix in proportion as follows: Old floor sand 5, Mode Wheel sand 5, coal dust 2. For bench work: Old floor sand 5, Mode Wheel sand 5, Mansfield sand 3, coal dust by measure 2. The first trodden and riddled, the latter milled and sieved onto the pattern; both used as dry as possible. Ram up only sufficiently to hold together. A soft surface held up by a harder backing is better than the reverse; but see that the top sand is rammed as lightly as possible. If the mold can be rammed lightly no venting is necessary, except to cores. To secure this, have plenty of bars in your boxes, and ram well around the edges, leaving the inner sand as loose as possible.

Following these principles, we found it possible to obtain a good top face which would machine up clean all over, there being simply a thin top skin containing all the loose dust, easily removed in one cut on the machine. Such articles as face plates, chucks, surface plates,

we molded face up in preference to molding with the rims or ribs up, for all the dust would then probably have flowed to one place, forming ugly hollows in the ribs and projecting parts.

When it is impossible to avoid dirt in upward projections by gating in the usual manner, it is sometimes advisable to so arrange the gates that all dirt will be forced to some obscure part of the casting. In the case of a solid block, what is termed a "whirl" gate—a gate cut to form a circular path for the metal, and to give it a whirling motion round the mold, will tend to force the dirt to the center of the casting, given, of course, sufficient speed of flow (obtained by a good head and rapid pouring).

Plumbago facing is all right, but should not be slicked with tools as this has the effect of closing the natural vents. If necessary to smooth it, use a camel-hair brush. The coal dust in the sand serves to render it more open, and also to prevent to a certain extent the hot metal from "eating" into the sand. In the case of brass work, however, the sand is sufficiently refractory without any auxiliary in the shape of coal, plumbago, etc. And the molten brass not having the same fluidity as iron might inclose the gas developed from the coal dust more readily than iron.

Fires.

The plant of the National Foundry & Supply Co. at New Stanton, Pa., burned recently.

The foundry of the Brightman Furnace Co., Cleveland, O., was practically burned to the ground and a number of patterns destroyed in a recent fire.

The Ohio Foundry Co., Dayton, O., lost its plant in a fire May 25. The damage is estimated at $25,000.

The plant of the Midland Mfg. Co., Tarkio, Mo., burned June 3, entailing a loss of $30,000.

The Old Colony Iron Foundry at East Bridgewater, Mass., was destroyed by fire May 21. A new fire-proof pattern shop will at once be erected, together with a foundry slightly larger than the old plant.

The Hall Iron Works at Lockport, N. Y., burned May 29. A number of patterns were lost, the total damage being estimated at $15,000.

The Kenton Hardware Mfg. Co.'s plant at Kenton, O., burned to the ground recently, throwing 150 men out of employment. It was one of the leading producers of iron toys in the country.

The Waterous Engine Works, St. Paul, Minn., was burned May 22, entailing a loss of $60,000.

The Reid & Brown foundry at Toronto, Ont., burned June 6.

In a general fire at Tilsonbury, Ont., the John A. Darrow foundry was destroyed June 1st.

The plants of the Milwaukee Commutator Co. and the Milwaukee Brass Mfg. Co., at Milwaukee, Wis., were destroyed by fire May 19.

The brass foundry of Robert Mitchell & Co., Montreal, P. Q., burned May 24, resulting in a loss estimated at $100,000.

The plant of the Northern Iron Works at Winnipeg, Manitoba, burned recently, causing a loss of $20,000.

Moore Brothers' foundry at Elizabeth, N. J., was badly damaged in a recent fire.

Kranks Korner.

Replying to a question as to the best way of making grate bars the editor of an English journal, professing to know something about the foundry business, recommends the bedding of these in the floor and covering with a light top part. In addition he suggests that plenty of well mixed sand be kept on hand. This is the kind of advice that is worth money, if it is not followed too closely.

* * * * *

The Rochester (N. Y.) *Chronicle* prints the following item, which would tend to show that the cupolas in that part of the country attain a ripe old age:

"The Ossian street foundry, of Dansville, has just completed the largest casting that has ever been produced at the works. It is a pile-driver hammer, weighing 2,300 pounds. The cupola used for the construction was the same one that was used when the foundry was opened sixty-eight years ago. The first iron was melted in this cupola on Christmas Day, 1836."

* * * * *

I have previously referred to queer statements presented against the enactment of an 8-hour law. One concern thought that if this should pass it would have to blast the iron out of its cupola each day, if the props should not be yanked out from under the doors before the time limit expired. Now comes an-

other Pennsylvania foundry and recounts the troubles it would run against, as follows:

"Again, an eight-hour system in a foundry would be ruinous, as nothing could be accomplished therein from the mere fact that the manufacturer is now compelled to put the blast on at 3 o'clock on the ten-hour basis. On the eight-hour basis no molding could be accomplished in the afternoon, and nothing would result from the afternoon's work but merely the running of the blast."

Evidently this foundry is now taking three hours to run off its heats, leaving seven hours in which to do molding. The manufacturers of cupolas and melting equipment are very busy, but undoubtedly they could find time to furnish this concern another cupola by which it would be enabled to take off a heat in an hour. There is no excuse whatever for a management to keep its molders waiting three hours to pour the few molds each has made in seven hours. The only force compelling it to do so is the lack of sufficient melting capacity or absence of crane facilities to handle metal in the proper manner.

* * * * *

The offering of prizes for suggestions which will decrease the cost of a shop's output is very well in its way, and yet there is something lacking about this method in the way of equality. As generally conducted it is something more or less of a lottery and even the party awarded the highest prize does not always receive full value for what he has done. If he devises means whereby a thousand dollars are saved a year in manufacturing a certain article it does not seem right to hand him twenty-five in the form of a prize and keep the nine hundred and seventy-five, does it? Shouldn't he be given something more lasting and tangible? On the other hand a suggestion of very small value may receive no encouragement whatever under the prize system, and yet not to recognize it is to discourage further efforts from that source.

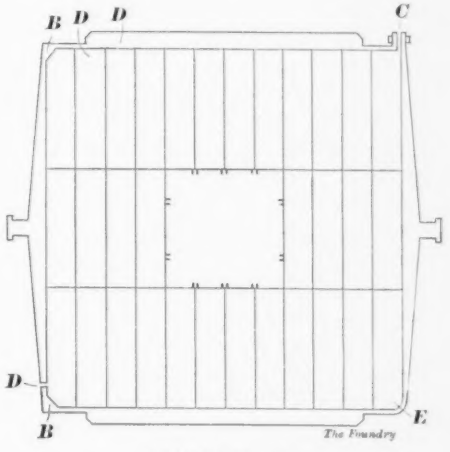
* * * * *

I note in a recent issue that our friend A. M. Loudon reduces a shop's fuel bill from $5,355 to $3,750, all with a few strokes of a pencil. He does this on the strength of his belief that every foundry can just as well melt 10 pounds of iron with a pound of coke as 7.

There exists considerable difference of opinion on this point however, which is not changed in favor of a high melting ratio by the example of melting shown by Mr. Loudon, in which he fails to reach a ratio of 1 to 9 in a heat of 20 tons.

Broken Flasks.

Very little has been written or said on this subject except when some molder has had a drop out in the shop and then his language would scorch the paper, if it should be attempted to write it down. It is mainly jobbing foundries who suffer from this ailment, indeed some of these have little else but broken flasks, cramped together or patched in various ways, more or less efficient. On starting to work in one shop I was given a pattern to bed in the floor and a cope 1 foot 6 inches by 3 feet to cover it. The pattern had a number of ribs which



BROKEN FLASKS.

had to be fastened and lifted with the cope, and when I came to use the flask I found it was very rusty, and broken on one side, when I tried to hold it together by fastening a clamp to two of the bars. This appeared to be solid, but on turning the cope over, after finishing, the whole thing dropped out. It is needless to say that this was rather discouraging for a starter, but nothing more could be done that day, and the next morning I found that both the bars to which the clamp had been attached were broken at one end, the rust having prevented me from noticing this at the start As the box was already broken on one side, only good luck prevented it from being broken in two.

The attached illustration shows another

cope 6 feet square, made in the same shop to replace one which gave out after a very short life. To obtain greater strength the molder making this thickened the ends as shown and put in heavy corners as at B. This cope broke the first time it was used to cover a heavy casting; and when the molder was asked the reason for it giving way, he thought this was due to a weak iron. Instead of such being the case the fault laid in the design and treatment after casting rather than in the iron. C shows a makeshift often used with fair results, when the corners are cast open and bolted together with a bit of wood between the metal. This, however, is only a partial remedy, as the flask will break in other places besides the corners; the one shown in the illustration having broken at the three places marked D.

In casting flasks of this kind the metal is dropped down the ends of the mold or run along the sides and is practically solid by the time it comes to rest in the bars, which are always thinner than the frame, with the result that the bars have contracted their full limit before the frame starts shrinking, when enormous strains are set up. When a flask of this kind is in use over a heavy casting the bars become almost red hot each time they are used, while the frame is kept cool by exposure to the air. This is constantly increasing the strains in the frame until the limit is reached, when it bursts. There are at least two remedies for this state of affairs: the bars can be made as heavy as the frame so that they will cool evenly, though this is only practicable with comparatively light flasks; then again the bars can be covered with sand as soon as cast to make them retain their heat, while the frame should be uncovered so that it may cool first, when the initial strain will be in the bars and each time the flask is used this will be relieved. The corner E is also an improvement over B, as the latter is too rigid and possesses no elasticity in case of a sudden shock and therefore breaks at D, the weakest point. I notice some of our English molders are in the habit of speaking contemptuously of the wooden flasks used in American foundries. I have never used these, but we have in this shop a couple of wooden barrows for wheeling pig iron or castings which are easier to handle and have outlasted at least half a dozen wrought iron barrows. It may be that wooden flasks are just as efficient if one knows where to use them.

H. SAYERS.

Recent Patents.

Patent No. 719,250 has been granted J. F. Nolan, of Chicago, on a method of making cores. The sand is forced into the core boxes through vibration and means are provided for supporting core rods in each half of the core, while this is being made.

C. D. Cannon has assigned his patent, No. 719,744, to C. S. Cannon, of Battle Creek, Mich. This covers a method of making wheel hubs and other similar articles by stamping a piece of sheet iron into the shape of the outside of the article, packing sand around this and casting it in the usual way. It is evident that this is intended to take the place of the cores usually employed for this purpose.

J. G. Emrich, of Columbus, O., has patented the construction of a core anchor No. 720,011, consisting of a center post supported by the bottom board and having a crown piece bearing radiating wings. This is undoubtedly intended to be used with green sand cores which carry large quantities of sand without having a sufficient base to support the necessary weight.

Robert Campbell, of Gadsden, Ala., has patented an apparatus for use in connection with the making of cores for soil pipe castings No. 720,220. This includes a vertical chute, placed below a hopper, through which the sand is let fall onto the core barrel, the force of the impact causing the sand to adhere thereto.

A hand press has been designed by A. E. Hammer, of Branford, Conn., for which patent No. 720,690 has been granted. The head is loosely pivoted on a horizontal bar to permit it to equalize the pressure on all parts of the sand; a stationary, but removable, pattern plate permits the ready substitution of different patterns.

A molding machine invented by F. W. Hall, of Camden, N. J., patent No. 720,913, is provided with a fluid operated ramming device so arranged that the core and drag may be rammed simultaneously.

P. J. McGuire, of Blairsville, Pa., has assigned a series of patents on molding bath tubs to the Champion Sanitary Enamel Ware Co., No. 721,726, covers a flask; No. 721,727, a support for the pattern and flask together with means by which the pattern may be adjusted

to give the desired thickness of metal; No. 721,728 relates to the placing of gaggers around the flask, each being independently adjusted; No. 721,729 covers the mounting of a pair of ladles on a frame supported by a hoist and adopted to be operated independently, so that pouring may take place in two gates at once; No. 721,730 is on a method of coring openings in the walls of tubs.

C. M. Day, whose death was announced a short time ago, and John Anderson, assigned the patent, No. 721,785, to the Draper Co., of Hopedale, Mass. This is a stripping plate machine for molding pulleys.

Charles Phelps, of Oskaloosa, Ia., has designed an adjustable flask, upon which he has been allowed patent No. 721,831. This is made of sheet metal, sides and ends being kept in stock in various lengths so that they can be easily put together to form any size of flask required.

Patent No. 721,837 has been granted W. D. Ross, of Woodlawn, Pa., for a collapsible core bar to be used in molding cast iron pipe.

The Monongahela Foundry & Forge Co., Monongahela, Pa., has purchased Alfred Lotz's patent No. 722,120, covering a drop jarring molding machine provided with a stripping plate.

W. L. Mars, of Buffalo, has patented an apparatus for drying molds and pipe cores, No. 722,312. The furnace is placed on the floor level, while the oven is located in the pit.

Frank Britz, of West Superior, Wis., has devised a machine for making pipe cores, patent No. 722,670, which is so arranged as to give the core a coating of loam through the medium of a strike having a curved face to fit the core. Arrangements are made so that a coat of blackening may be given it at the same time without stopping the machine.

Patent No. 723,151 has been granted to Stanton Griffith, of Seneca Falls, N. Y., on a flask and pattern designed to be used in connection with vibrator molding machines.

The Holyoke Machine Co., of Worcester, Mass., have a special design of a molding machine for large castings, invented by James Reid, Jr., who has been granted patent No. 723,548.

H. M. Baldwin, of New York, has received patent No. 723,572 on his vibrating hammer.

The Pratt & Letchworth Co., Buffalo, N. Y., has purchased patent No. 725,210, granted J. C. Bradley and T. H. Gilbert, of Buffalo, on a machine for drawing patterns.

The American Steel Foundries have obtained control of F. W. Hudson's patent No. 723,529, covering a power ramming machine of very large capacity. One of these machines has been in use for some time in the East St. Louis plant of that company, where it serves six molding machines, turning out car bolsters. The flasks are about 10 feet long, 24 inches wide and 12 inches deep, and the ramming machine does the necessary sand pounding on one of these in about two minutes. The machine resembles a traveling gantry crane and is provided with a number of ramming heads, each working independent of the other. Spanning a wide molding floor it moves from one machine to the other and while in operation is clamped to the rails upon which it travels. It is moved by an electric motor, while the ramming heads are actuated by compressed air. But one man is required to operate this machine, which weighs about eight tons.

A. L. and O. Anderson, of Chicago, have patented a crane, No. 725,312, which is designed to be operated especially in connection with molding machines.

A. E. F.

Notes From Various Sources.

The Hyle Tool Steel Co. will erect a plant at Syracuse, N. Y., which will include a department for the production of steel castings.

The Cresson Foundry, Machine & Car Co., has been incorporated to do business at Cresson, Pa.

A large brass foundry is desirous of securing a vibrator for use in connection with brass molders' tubs. Certain devices of this character have been tried but found unsatisfactory on account of their lightness.

The Tabor Mfg. Co., of Philadelphia, announces that it has arranged with the Draper Co., of Hopedale, Mass., for the manufacture and sale of hand-ramming molding machines, which the latter firm has been building for its own use. This machine will go into places and be used for lines of work for which it is especially adapted, either in connection with or independently of the Tabor molding machine.

The Loller Mfg. Co., has been organized at Columbus, O., to manufacture plumbers' supplies. The capital stock is $350,000.

L. J. Irwin will establish a foundry at Anacortes, Wash.

The Christensen Engineering Co. of Milwaukee, Wis., manufacturers of air brakes

and "Ceco" electrical machinery, will hereafter be known as the National Electric Co. The constantly increasing demand for Christensen air brakes and "Ceco" electrical machinery has made the change of organization necessary. To accomplish this result the owners of the stock of this company have organized the National Electric Co. and the assets, good will, etc., of this company have been transferred to the National Electric Co., the purposes, ownership, management and control of the new company are identical with those of the old.

The Johnson Printing Press & Foundry Co. has been incorporated at Elk Falls, Kansas, with a capital of $50,000.

On behalf of the St. Louis Manufacturers' Association, L. D. Kingsland, President, invites foundrymen who may visit St. Louis, Mo., either before or during the exposition to spend a portion of their time in seeing the manufacturing plants of that city. Every facility of the Manufacturers' Association will be placed at the disposal of vistors.

The Penobscot Machinery Co., of Bangor, Me., will erect a foundry 40x60 feet.

Dean, Watterman & Co., of Cincinnati, has purchased the plant of the Covington Foundry Co., Covington, Ky., Morris B. Dean, the senior member of the firm, was for many years connected with the Samuel H. Tatum Mfg. Co., of Cincinnati, and O. J. Watterman, who is also a Cincinnatian, with a large experience in the iron industry, will greatly enlarge the plant, and, in addition to manufacturing machinery castings, will make gas engines, stamps, and numerous other articles. It is the intention of the new firm to increase the capacity of the plant threefold.

The Northern Electrical Mfg. Co., of Madison, Wis., has issued Bulletin No. 16, illustrating direct current generators. Copies of this may be had upon application.

The Brock Engineering Works has been incorporated at Chicago, with a capital of $60,000, by Walter I. Brock, Alfred Marshall and George W. Hurd.

The Keystone M. & M. Co., of Lebanon, Pa., may establish a foundry to be operated in connection with its other departments.

A foundry to be conducted on the co-operative plan has been organized at Toledo, O., under the name of the Toledo Co-operative Foundry Co., with a capital stock of $25,000.

A. Barrett, of Miami, Fla., intends to add a foundry to the machine shop he is now conducting at that point.

T. P. Kelly & Co., of Chicago and New York, have increased their facilities at the latter place and have also recently opened a new mill near a breaker in the vicinity of Mauch Chunk, at Nesquahoning, Pa., which is equipped with every modern improvement. It is under the management of T. T. Hoffman, a practical facing man.

Thos. and R. E. Calhoun, will establish a foundry at New Brighton, Pa., occupying a building 40x100 feet.

The Goubert Mfg. Co., makers of feed water heaters, separators, condensers, etc., will erect a modern plant at Bayonne, N. J., to cost $150,000.

The J. D. Smith Foundry Supply Co., of Cleveland, O., has just issued catalogue No. 36, consisting of 330 pages of descriptive matter covering every form of foundry equipment and supplies. Copies will be mailed upon application.

Lead and Zinc Alloys.

Lead and zinc will not combine except in very small amounts. If equal parts of lead and zinc are melted together and poured into a mold, even after a thorough stirring just before pouring, the lead will be found at the bottom and the zinc at the top. The zinc at the top of the mold will contain a little lead, and the lead at the bottom will contain a small amount of zinc. Zinc will take up from one to two per cent of lead before separation commences. Lead and antimony combine in all proportions, and zinc and antimony; but if lead is added in large amounts to zinc alloys separation invariably follows. No method of preventing it appears to be known.

In melting an alloy of copper, lead and tungsten, borax forms a good flux. The nature of a flux is to prevent access of air and products of combustion, and, therefore, any covering which will melt will answer. Equal parts of fluor-spar and glass also make a satisfactory flux, but act on the crucible. Common salt is also extensively used. Borax, however, is a very satisfactory flux, but is somewhat expensive.—*The Metal Industry.*

An addition is being built to the foundry of J. Woodruff & Sons, Salem, O.